Growatt
powering tomorrow

Growatt 10000TL3-US

Growatt 12000TL3-US

Growatt 18000TL3-US

Growatt 20000TL3-US

Installation & Operation Manual ▶

GROWATT NEW ENERGY CO., LTD

No. 28 Guangming Road, Shiyan, Baoan District,
Shenzhen, P.R. China

T + 86 755 2747 1942
F + 86 755 2747 2131
E info@ginverter.com
W www.growatt.com

GR - UM - 004 - 02

Table

1 Information on this Document
- 1.1 Validity
- 1.2 Target Group
- 1.3 Storage of the manuals
- 1.4 Additional information
- 1.5 Symbols in this document

2 Safety
- 2.1 Intended Use
- 2.2 Qualification of skilled person
- 2.3 Safety instruction
- 2.4 Operation Warnings

3 Product Description
- 3.1 Growatt TL3-US
- 3.2 Type label
- 3.3 Size and weight
- 3.4 The advantage of the Growatt TL3-US inverters

4 Unpacking

5 Installation
- 5.1 Safety instructions
- 5.2 Selecting the Installation Location
- 5.3 Mounting the Growatt TL3-US
- 5.4 Electrical Connection
- 5.5 Grounding
- 5.6 GRID Type and Grid type
- 5.7 Growatt TL3-US WIRE BOX
- 5.8 RS485 Signal Wiring Connections

6 PV Module setting

7 Commissioning
- 7.1 Display and message
- 7.2 Operation checking on the Growatt TL3-US
- 7.3 Two independent MPPT
- 7.4 Communication

8 Booting and shutdown of the inverter
- 8.1 Booting the Growatt TL3-US
- 8.2 Turn off the Growatt TL3-US

9 Cleaning and Care
- 9.1 Checking the inverter
- 9.2 Checking the DC switch
- 9.3 Cleaning the Inverter
- 9.4 Cleaning the Fan Guards
- 9.5 Replace fans

10 Decommissioning
- 10.1 Dismantling the Growatt TL3-US
- 10.2 Packaging the Growatt TL3-US
- 10.3 Storage of inverter.
- 10.4 Disposal

11 Trouble Shooting
11.1 Warnings(W)
11.2 Errors(E)
12 Specification
12.1 Specification of the Growatt TL3-US
12.2 DC Switch information
12.3 Tripping Limits and Tripping Times
12.4 Torque Values and Cable Sizes
13 Spare Parts and Accessories
14 Inverter installation plan
14.1 Single inverter
14.2 Multi inverter
15 Contact

1.1 Validity

This manual describes the assembly, installation, commissioning and maintenance of the following GROWATT inverters:

- Growatt 10000TL3-US
- Growatt 12000TL3-US
- Growatt 18000TL3-US
- Growatt 20000TL3-US

1.2 Target Group

This manual is for qualified personnel. Qualified personnel have received training and have demonstrated skills and knowledge in the construction and operation of this device. Qualified personnel are trained to deal with the dangers and hazards involved in installing electric devices.

1.3 Storage of the manuals

Keep all Growatt manuals in a safe place for future reference.

1.4 Additional information

You can find further information on special topics in the download area at

www.growatt.com

1.5 Symbols in this document

1.5.1 Warnings in this document

A warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of Growatt equipment and/or other equipment connected to the Growatt equipment or personal injury.

Symbol	Description
DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	NOTICE is used to address practices not related to personal injury.
INFORMATION	INFORMATION that you must read and know to ensure optimal operation of the system.

1.5.2Markings on this product

	Warning regarding dangerous voltage The product works with high voltage. All work on the product must only be performed as described in its documentation.

Beware of hot surface

The product can become hot during operation. Do not touch the product during operation.

Observe the operating instructions

Read the product's documentation before working on it. Follow all safety precautions and instructions as described in the documentation.

AC current

DC current

Transformerless

Earth Ground

FCC certificate

UL1741 Standard for Safety for Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources. CSA CSA-C22.2 No. 107.1-01 - General Use Power Supplies.

1.5.3 Glossary

AC
Abbreviation for "Alternating Current"

DC
Abbreviation for "Direct Current"

Energy
Energy is measured in Wh (watt hours), kWh (kilowatt hours) or MWh (megawatt hours). The energy is the power calculated over time. If, for example, your inverter operates at a constant power of 20,000 W for half an hour and then at a constant power of 10,000 W for another half an hour, it has fed 15,000Wh of energy into the power distribution grid within that hour.

Power
Power is measured in W (watts), kW (kilowatts) or MW (megawatts). Power is an instantaneous value. It displays the power your inverter is currently feeding into the power distribution grid.

Power rate
Power rate is the radio of current power feeding into the power distribution grid and the maximum power of the inverter that can feed into the power distribution grid.

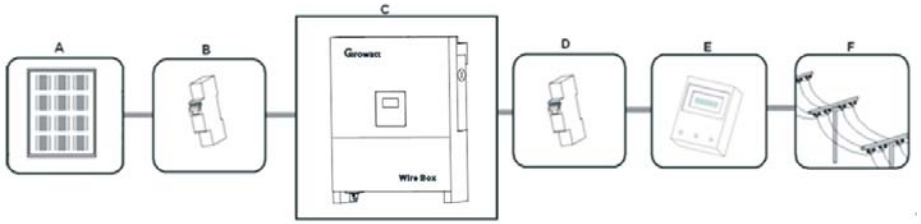
Power Factor
Power factor is the ratio of true power or watts to apparent power or volt amps. They are identical only when current and voltage are in phase than the power factor is 1.0. The power in an ac circuit is very seldom equal to the direct product of the volts and amperes. In order to find the power of a single phase ac circuit the product of volts and amperes must be multiplied by the power factor.

PV
Abbreviation for photovoltaic

Wireless communication
The external wireless communication technology is a radio technology that allows the inverter and other communication products to communicate with each other. The external wireless communication does not require line of sight between the devices and it is selective purchasing.

2.1 Intended Use

The Growatt TL3-US is a PV inverter which converts the direct current of the PV array to alternating current and feeds it into the power distribution grid.



Symbol	Description
A	PV modules
B	DC load circuit breaker(type 2 wire box no need)
C	Growatt TL3-US Inverter
D	AC load circuit breaker
E	Energy meter
F	Utility grid

The Growatt TL3-US takes current from PV array and converts it to alternating current for the power distribution grid (F). Energy surplus may even result in the energy meter (E) of your plant running backwards. The Growatt TL3-US is suitable for indoor and outdoor use.

AC circuit breaker

Each inverter with independent circuit breaker with three or four poles can make sure to disconnect the grid safely.

CAUTION	Do not share a single circuit breaker with more than one inverter. Do not connect the any local load between the inverter and the AC circuit breaker.

PV modules

The PV modules used must be suitable for use with the Growatt TL3-US and must be approved by the module manufacturer. The PV modules include Monocrystalline silicon PV modules, polysilicon PV modules, and the thin-film PV modules which with levels of protection and without connecting to the Ground.

CAUTION	PV modules with large capacities relative to earth, such as thin-film PV modules with cells on a metallic substrate, may only be used if their coupling capacity does not exceed 500 nF. Do not connecting any PV Modules that the anode or the cathode needs to connect to the Ground. Do not connect any energy sources other than PV modules to the Growatt TL3-US. Do not connect the any local load between the inverter and the AC circuit breaker. The Growatt TL3-US is only used in the Grid-connected system rather than any other applications.

2.2 Qualification of skilled person

This grid-tied inverter system operates only when properly connected to the AC - distribution network. Before connecting the services of Growatt TL3-US to the power distribution grid, contact the local power distribution grid company. This connection must be made only by qualified technical personnel to connect, and only after receiving appropriate approvals, as required by the local authority having jurisdiction.

2.3 Safety instruction

The GROWATT TL3-US Inverters is designed and tested according to international safety requirements (UL 1741/IEEE 1547); however, certain safety precautions must be observed when installing and operating this inverter. Read and follow all instructions, cautions and warnings in this installation manual. If questions arise, please contact Growatt's technical services at +86 (0)755 2747 1900.

2.3.1 Assembly Warnings

WARNING	Prior to installation, inspect the unit to ensure absence of any transport or handling damage, which could affect insulation integrity or safety clearances; failure to do so could result in safety hazards. Assemble the inverter per the instructions in this manual. Use care when choosing installation location and adhere to specified cooling requirements. Unauthorized removal of necessary protections, improper use, incorrect installation and operation may lead to serious safety and shock hazards and/or equipment damage. In order to minimize the potential of a shock hazard due to hazardous voltages, cover the entire solar array with dark material prior to connecting the array to any equipment.

2.3.2 Electrical Connection Warnings

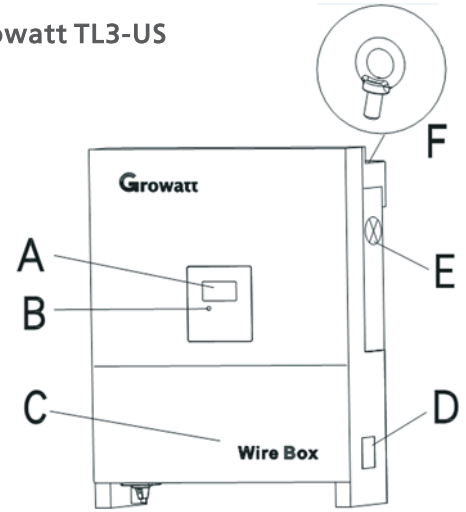
WARNING	Make all electrical connections (e.g. conductor termination, fuses, PE connection, etc.) in accordance with prevailing regulations. When working with the inverter powered on, adhere to all prevailing safety regulations to minimize risk of accidents. Systems with inverters typically require additional control (e.g., switches, disconnects) or protective devices (e.g., fusing circuit breakers) depending upon the prevailing safety rules.

DANGER	➢ The components in the inverter are live. Touching live components can result in serious injury or death. Do not open the inverter except the wire box by qualified persons. Electrical installation, repairs and conversions may only be carried out by electrically qualified persons. Do not touch damaged inverters. ➢ Danger to life due to high voltages in the inverter There is residual voltage in the inverter. The inverter takes 20 minutes to discharge Wait 20 minutes before you open the wire box.

2.4 Operation Warnings

WARNING	➢ Anytime the inverter has been disconnected from the power network, use extreme caution as some components can retain charge sufficient to create a shock hazard; to minimize occurrence of such conditions, comply with all corresponding safety symbols and markings present on the unit and in this manual. ➢ Ensure all covers and doors are closed and secure during operation. ➢ All operations regarding transport, installation and start-up, including maintenance must be operated by qualified, trained personnel and in compliance with all prevailing codes and regulations. ➢ Although designed to meet all safety requirements, some parts and surfaces of Inverter are still hot during operation. To reduce the risk of injury, do not touch the heat sink at the back of the PV-Inverter or nearby surfaces while Inverter is operating. ➢ Incorrect sizing of the PV plant may result in voltages being present which could destroy the inverter. The inverter display will read the error message "PV-Overvoltage!" Turn the rotary switch of the DC Disconnect to the Off position immediately. Contact installer.

3.1 Growatt TL3-US



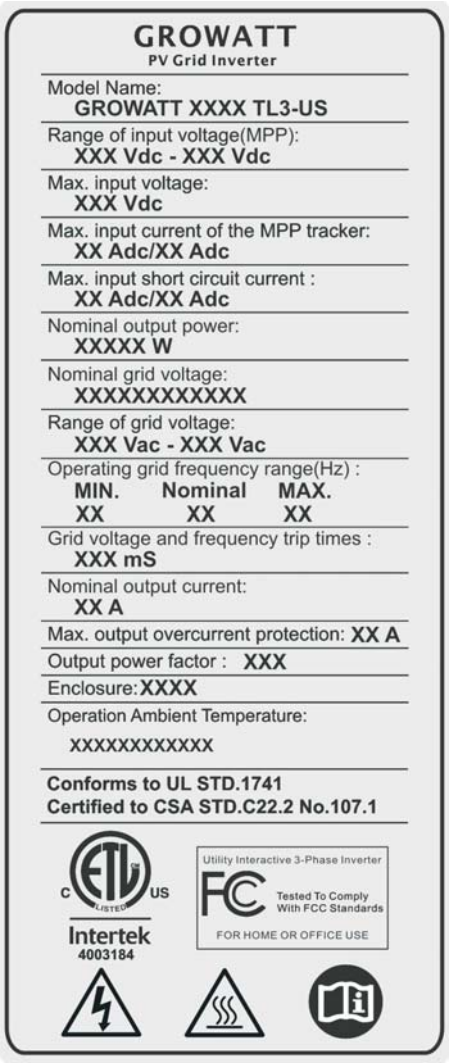
Symbol	Description
A	LCD
B	LED
C	Wire Box
D	Label
E	Fan air outlet
F	Flying rings

Symbol on the inverter

Symbol	Description	Explanation
	Tap symbol	Setting the display operation by tapping the LCD (see Section 4).
	Inverter status symbol	Indicates inverter operation status

3.2 Type label

The type labels provide a unique identification of the inverter (The type of product, Device-specific characteristics, Certificates and approvals). The type labels are on the right-hand side of the enclosure.



More detail about the type label as the chart below:

Label symbol	Growatt 10000 TL3-US	Growatt 12000 TL3-US	Growatt 18000 TL3-US	Growatt 20000 TL3-US
Range of input voltage(MPP)	250VDC~600VDC	250VDC~600VDC	250VDC~600VDC	250VDC~600VDC
Max input voltage	600VDC	600VDC	600VDC	600VDC
Max input current of MPP tracker	21.0ADC/21.0ADC	25.0ADC/25.0ADC	38.0ADC/38.0ADC	42.0ADC/42.0ADC
Max input short circuit current	32.0ADC/32.0ADC	32.0ADC/32.0ADC	50.0ADC/50.0ADC	50.0ADC/50.0ADC
Nominal output power	10000W	12000W	18000W	20000W
Nominal grid voltage	3/N/PE, 277Vac/480Vac	3/N/PE, 277Vac/480Vac	3/N/PE, 277Vac/480Vac	3/N/PE, 277Vac/480Vac
Range of grid voltage range	422Vac~528Vac	422Vac~528Vac	422Vac~528Vac	422Vac~528Vac
operating grid frequency range(HZ)	Min Normal Max 59.3 60.0 60.5	Min Normal Max 59.3 60.0 60.5	Min Normal Max 59.3 60.0 60.5	Min Normal Max 59.3 60.0 60.5
Grid voltage and frequency trip times	<150ms	<150ms	<150ms	<150ms
Max output current	12.0 A	14.5 A	21.5 A	24.0 A
Max output overcurrent protection	15.0 A	18.0 A	27.0 A	30.0 A
Output power factor	>0.99	>0.99	>0.99	>0.99
Enclosure	Type 3R	Type 3R	Type 3R	Type 3R
Operation Ambient temperature	-25°C~+60°C (Derating above 45°C) -13°F~+140°F (Derating above 113°F)			

3.3 Size and weight

Growatt 10000& 12000TL3-US

bare machine			
Dimension			Weight
Height	Width	Depth	
705mm(28inch.)	530mm(21inch.)	247mm(10inch.)	46kg(101lb.)
With packaging			
Dimension			Weight
Length	Width	Heigth	
805mm(32inch.)	691mm(27inch.)	465mm(18inch.)	57kg(126lb.)

Growatt 18000& 20000TL3-US

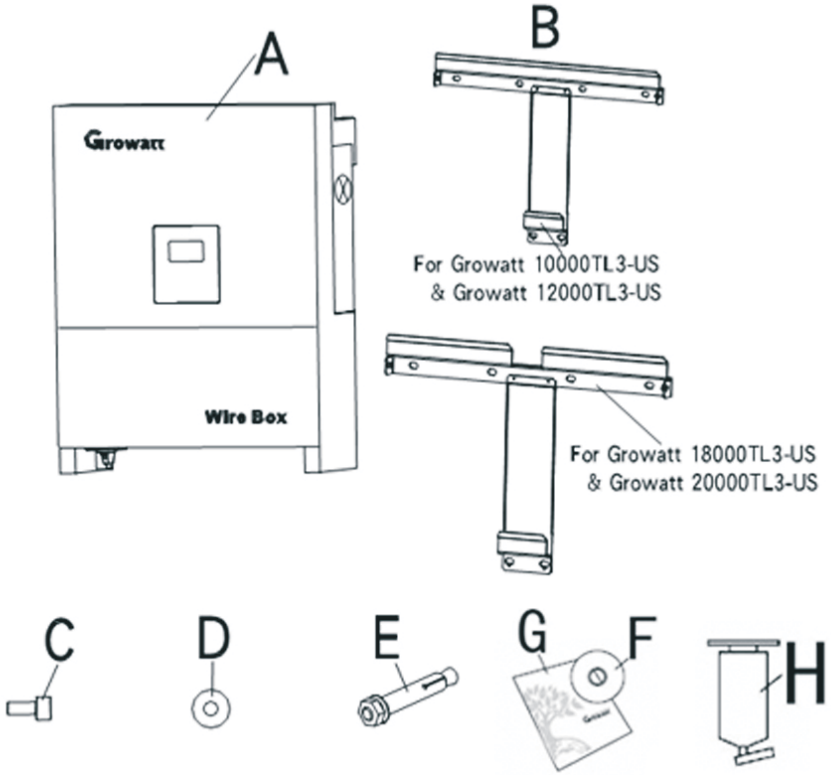
bare machine			
Dimension			Weight
Height	Width	Depth	
740mm(29inch.)	650mm(26inch.)	247mm(10inch.)	63kg(139lb.)
With packaging			
Dimension			Weight
Length	Width	Heigth	
860mm(34inch.)	830mm(33inch.)	465mm(18inch.)	78.5kg(173lb.)

3.4 The advantage of the Growatt TL3-US inverters

- High efficiency of 97.5% delivery more energy
- Dual independent MPP tracking lead to optimal energy harvesting and advanced MPPT algorithms
- Integrated DC disconnect switch
- Consistent and stable performance across entire input voltage and output voltage range.
- True three-phase transformerless GT topology.
- Bluetooth/ RF technology/ Zigbee/ Wi-Fi
- Sound control, easy installation maintenance procedure.
- Newest generation IGBTs and perfect Driver
- Flexible system design with safety fuse module and lightning proof module.
- Comprehensive protection for IGBTs, overvoltage, islanding, short-circuit, overload, overheat, etc
- Wide PV input working range: 80V~600V
  After 120V connected to the grid, the lowest working PV voltage will reach to 80V, especially for the nightfall condition.

4 UNPACKING

After opening the package, please check the contents of the box. It should contain the following parts:



Item	Name	Quantity
A	Solar inverter	1
B	Mounting bracket	1
C	Safety-lock screws	2
D	Safety Washer	2
E	Expansion bolt	4 or 6
F	Monitor software(disk)	1(Optional)
G	Manual	1
H	External wireless	1(Optional)

There are two kinds of mounting bracket, one type represents the bracket of Growatt 10000TL3-US and Growatt 12000TL3-US, and the other represents the bracket of Growatt 18000 TL3-US and Growatt 20000TL3-US.

5 INSTALLATION

5.1 Safety instructions

WARNING	Before instructions, anyone includes qualified, trained personnel, must make sure you have read the section 2.1, about the General installation warnings.

5.2 Selecting the Installation Location

Select the installation location based on the following considerations:

1) Select a well-ventilated location sheltered from direct sunlight and rain.

2) Choose a location that allows unobstructed airflow around the inverter.

3) Allow sufficient room around the inverter to enable easy installation and removal from the mounting surface.

4) Height from ground level should be at least 1 meter.

5) Access panels on the front surface of the inverter allow inspection and maintenance of hardware; and must not be blocked. The following Figure shows the recommended minimum clearances around the inverter.

6) When possible, mount the Growatt TL3-US Inverter vertically. For other mounting orientations consult with Growatt.

7) Tilted mounting (±15° from vertical) is acceptable for the Growatt 18000TL3-US and Growatt 20000TL3-US, tilted mounting (±3° from vertical) is acceptable for the Growatt 10000TL3-US and Growatt 12000TL3-US

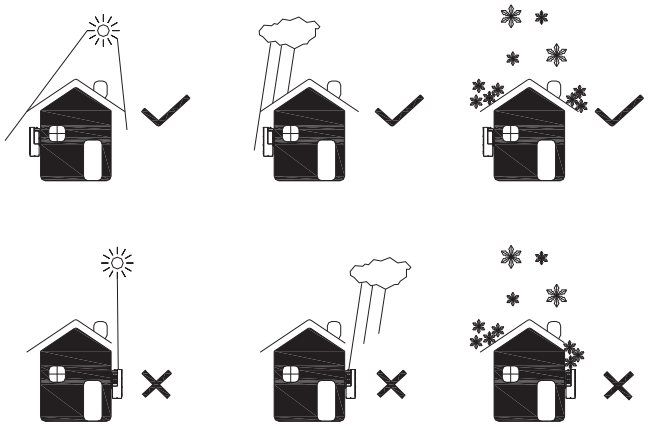
8) Inverter requires adequate cooling space, allowing at least 30cm space above and below the inverter while 50cm space of right and left.

9) The installation method and mounting location must be suitable for the weight and dimensions of the inverter. Select a wall or solid vertical surface that can support the PV-Inverter.

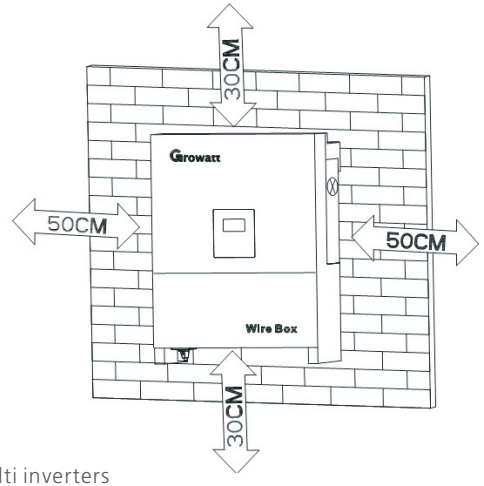
10) The location shall be away from strong electromagnetic interference.

11) The location shall not exceed Type3R standard according to ANSI/IEC_60529-2004.

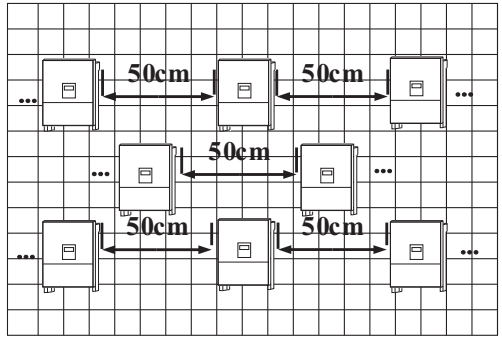
12) Possible location for Growatt TL3-US under the ceiling



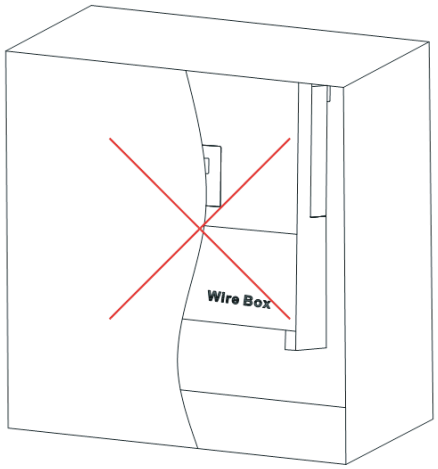
Minimum clearances around the inverter:

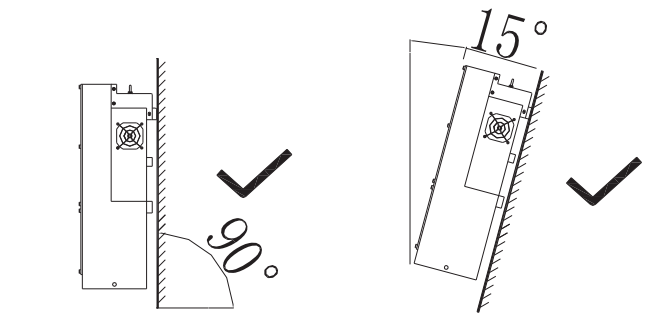


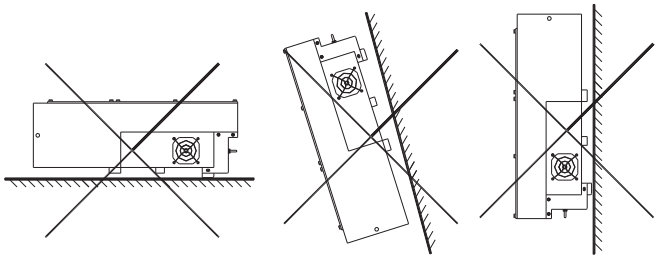
Clearances for multi inverters



Forbid locating the Growatt TL3-US into a close place







Tilted mounting (±15° from vertical) is acceptable for the Growatt 18000TL3-US and Growatt 20000TL3-US, tilted mounting (±3° from vertical) is acceptable for the Growatt 10000TL3-US and Growatt 12000TL3-US

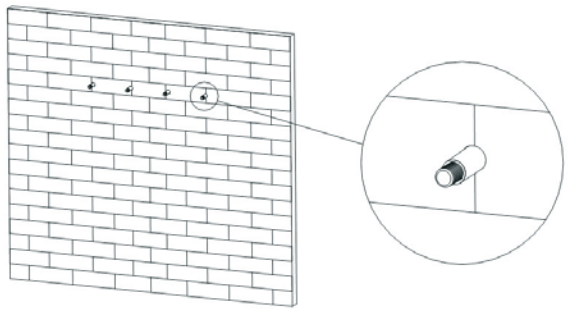
5.3 Mounting the Growatt TL3-US

- General tools
  - Personal safety equipment such as gloves, helmet, goggles, ear plugs, safety harness etc.
  - Step ladders.
  - Knife.
- Tools for mechanical installation

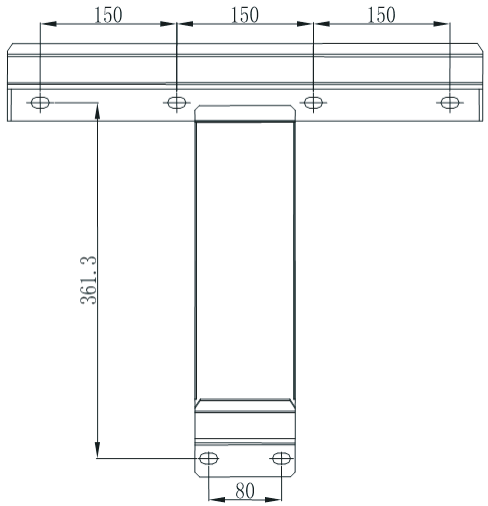
  Equipment for transporting and lifting the inverter.
  - Electric (hammer) drill.
  - Hammer.
  - Set of drill bits, wrenches, sockets and screw bits.
  - Socket driver, screwdriver.
  - Tape measure.
  - Spirit level.
  - Pencil or other marker.
  - Fastening screws, plugs, etc

Step 1: Drilling 4 holes!

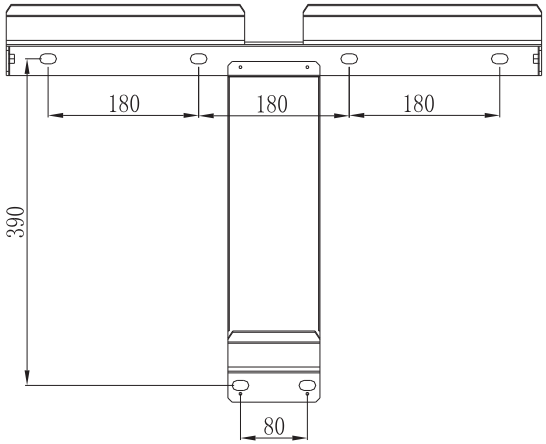
Using the mounting bracket as a template and drill 4 holes as illustrated in image, hole size: 10mm(diameter)*85mm(depth, at least), then insert 4 explosion bolts into the holes, make sure the bolts paralleled with the outer surface of the bracket.



(a) For Growatt 10000TL3-US and Growatt 12000TL3-US , the space between holes is 150mm, as figure below.

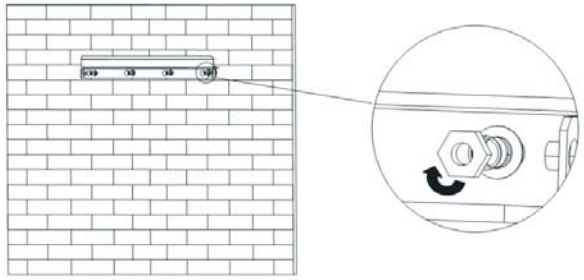


(b) For Growatt 18000TL3-US and Growatt 20000TL3-US , 6 holes need to be drilled. The space between holes is 180mm, as figure below.



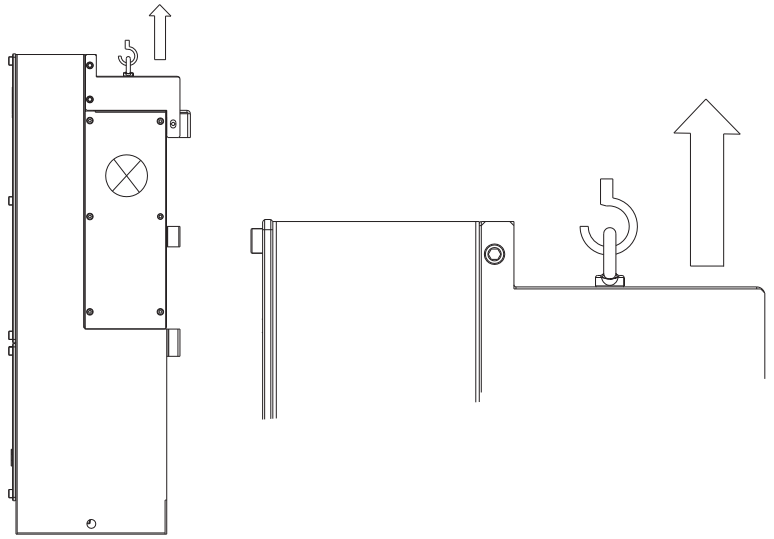
Step 2: Mounting the bracket!

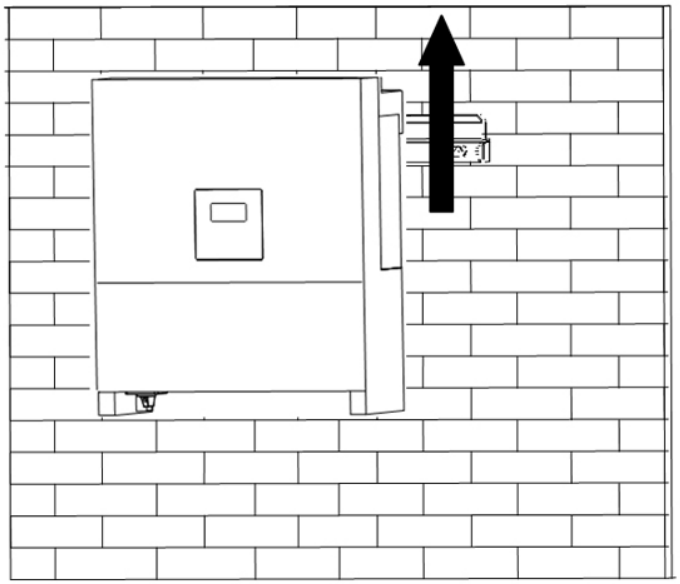
Mounting the bracket onto the wall and screw on the nuts to fasten the bracket, as the figure below.



Step 3:Mounting the inverter on the wall

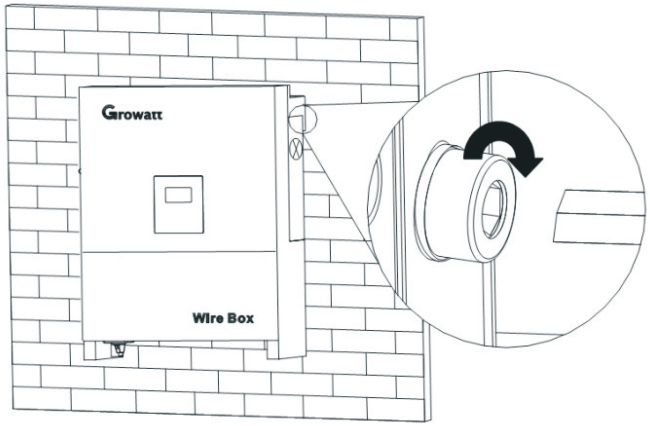
Rise up the Growatt TL3-US a little higher than the bracket. Considering the weight of the inverter, some tools may be needed to hang the inverter by the right and the left fly rings on the top of the inverter. During the process please maintain the balance of the Growatt TL3-US, as figure below.





Step 4: Insert safety-lock screws!

Insert safety-lock screws into the two side holes of the mounting bracket to fasten the inverter, as the figure below.



Step 5： Check!

Check the upper straps of PV Inverter and ensure it fits on to the bracket.

Check the secure mounting of the PV Inverter by trying to raise it from the bottom.

The PV Inverter should remain firmly attached.

The Growatt TL3-US is mounted.

5.4 Electrical Connection

5.4.1 Safety

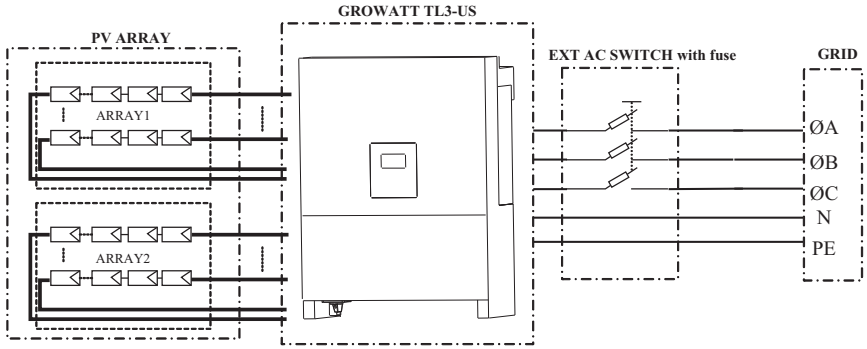
⚠	Before instructions, anyone includes qualified, trained personnel, must make sure you have to read the section 2.3, about the General installation warnings.

Electrical installations

i	All electrical installations must be done in accordance with all local electrical codes and the NATIOAL Electrical Code® , ANSI/NFPA 70. For installation in Canada the installations must be done in accordance with applicable Canadian standards. Before connecting the inverter to the power distribution grid, contact your local electric utility company. This connection may be made only by electrically qualified persons.

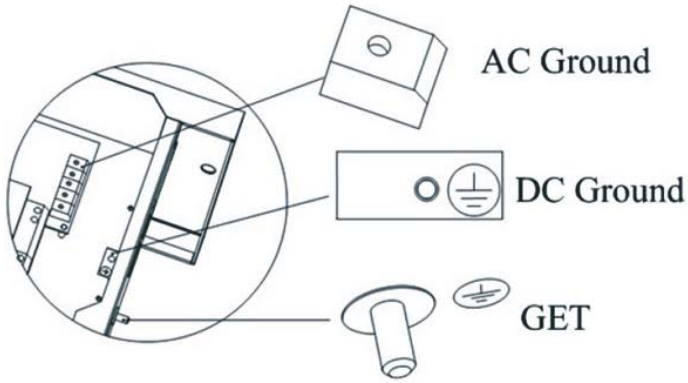
- Tools for electrical installation
  - Hexagonal driver 3mm for securing the front cover and AC connector.
  - Flat screwdriver 3mm for releasing spring terminals.
  - Cable and wire strippers.
  - Side cutters.
  - Crimping tool and cable lugs.
  - Cable marking equipment.
  - Digital multimeter (insulation tester) with DC and AC sensitive current clamp, voltage measurement (max. 1000 VDC) and continuity testing functions.

5.4.2 Wiring Diagram with Over-Current Protection Device and AC Disconnect



- **AC disconnect switch:** 3-pole, with or without neutral block depending upon chosen grid connection (3W or 4W). Voltage and current rating depends on the grid connection voltage and output power of the inverter being installed. The fuse size or breaker is depending on the rating of output current.

5.5 Grounding



AC Grounding

The Growatt TL3-US must be connected to the AC grounding conductor of the power distribution grid via the ground terminal (PE).
The AC input and AC output circuits are isolated from the enclosure and system grounding, if required by Section 250 of the National Electrical Code, ANSI/NFPA 70.

Grounding Electrode Terminal (GET)

A grounding electrode terminal may be required to local regulations.

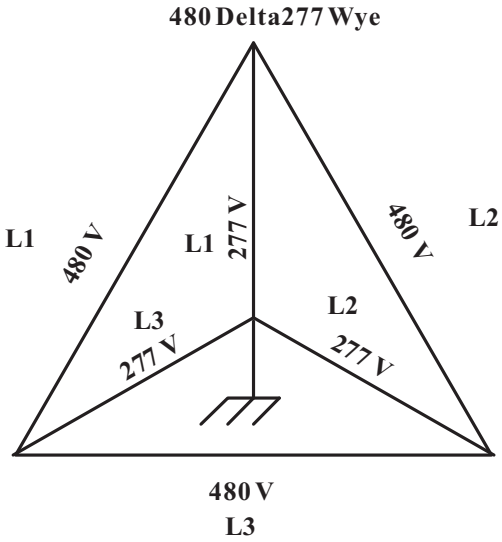
DC Grounding

Grounding of photovoltaic components (e.g., solar module frames)
The ground for photovoltaic components such as solar module frames must be connected at the grounding terminals. The size of the wire usually corresponds to the largest wire in the DC system.

5.6 GRID Type and Grid type

GRID standards:

Based on the local GRID standards, it may select different connection types. The available configurations are shown as below:



When using the 480Delta, the Neutral of the Growatt TL3-US must connect to the Earth of the grid and please contact Growatt.

i	Policies vary from one utility company to another. Consult with a representative of the local utility company before designing and installing a PV system.

Grid type:

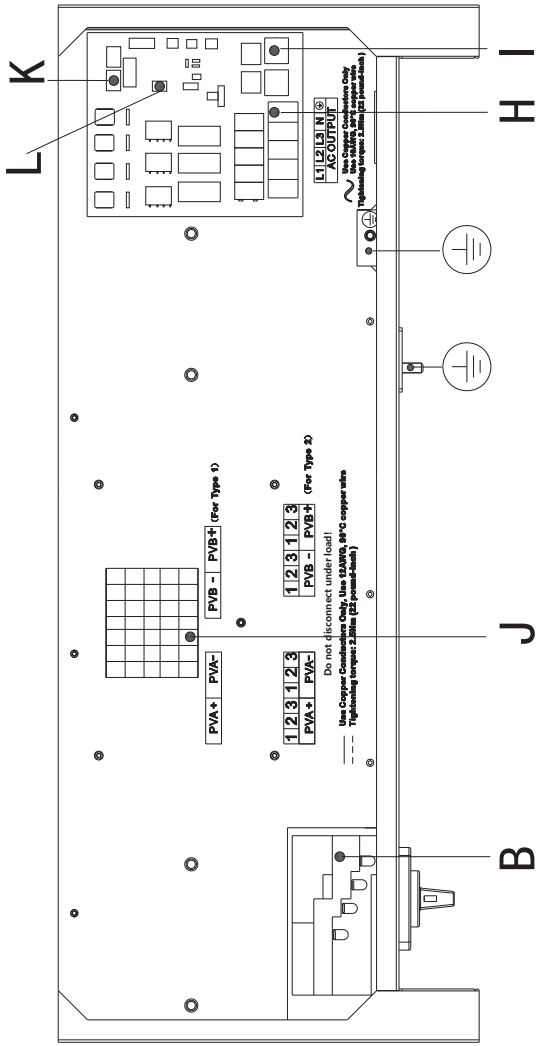
The Growatt TL3-US only used in TN-C/TN-C-S/TT/TN-S grid types, not available for IT and Split phase types.

5.7 Growatt TL3-US WIRE BOX

- Internal integrated DC Disconnect
- Integrated in the machine and convenient installation
- Listed to UL 1741 for the United States and Canada
- Simplified input wiring
- Compact, low-cost design
- Two types connection for High current input

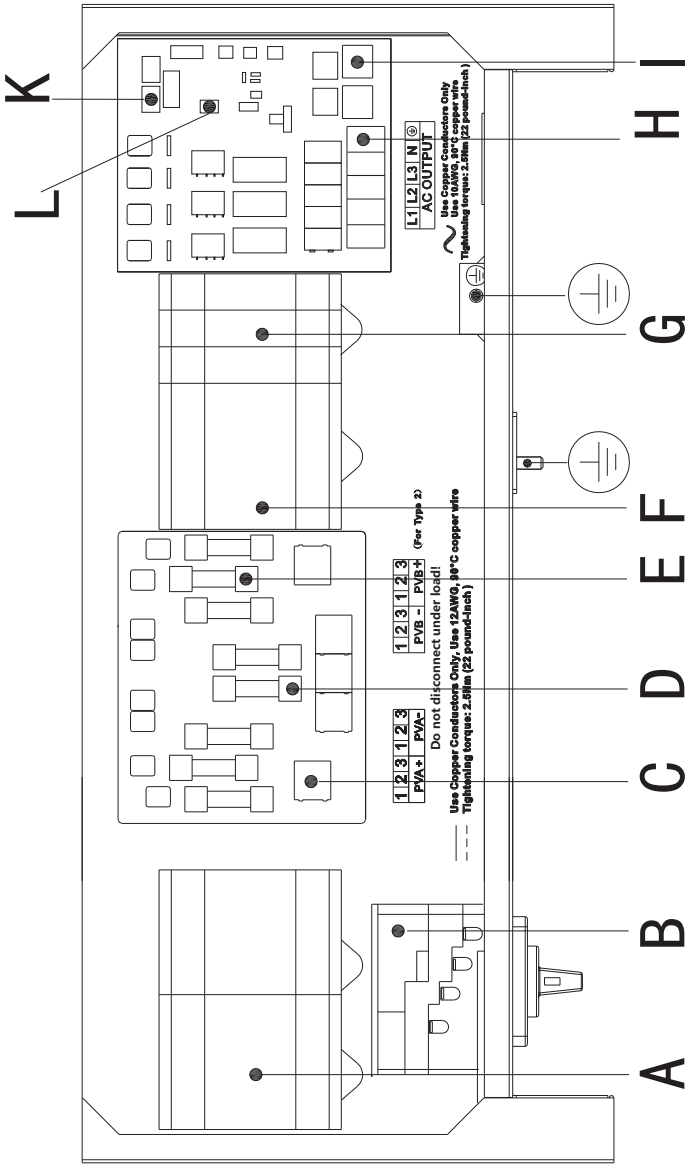
i	Every module of Growatt TL3-US has two types connection. Before connection, please check which type of the wire box is.

✔ Growatt 10000TL3-US & Growatt 12000TL3-US connecting type 1



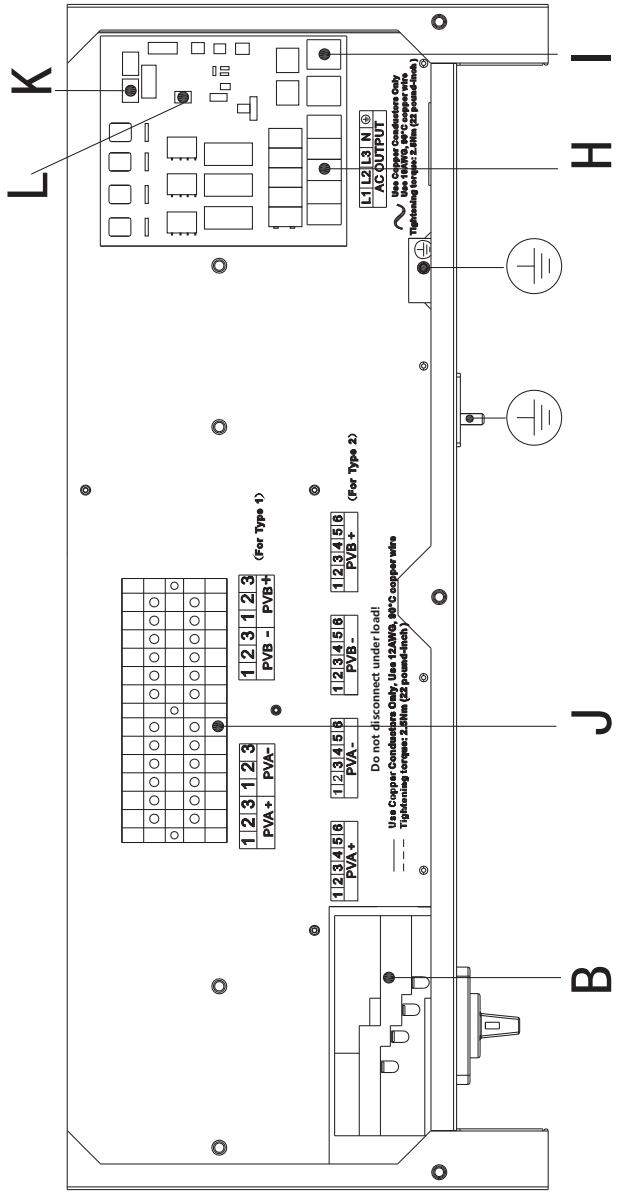
code	Details	
B	DC-SWITCH	600V/35A
J	DC Array MPPT input terminals	MPPT1(1 poles for PVA+ and 1 poles for PVA-) MPPT2(1 poles for PVB+ and 1 poles for PVB-)
H	Grid output terminals	A/B/C/N/PE
I	RS485 Connection	See section 5.3.10
K	Stem node	Note 3(Page 35)
L	PV Module Setting Switch	See section 6
⏚	Ground	See section 5.3.3

✔ Growatt 10000TL3-US & Growatt 12000TL3-US connecting type 2



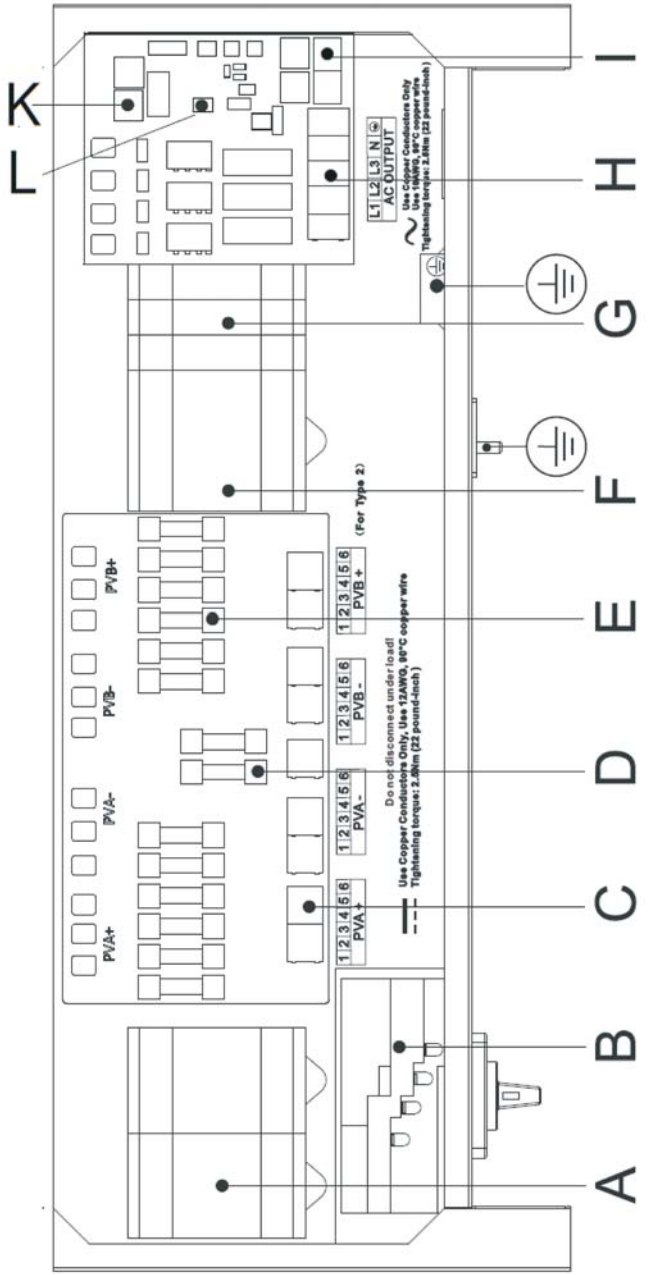
code	Details	
A	DC SPD	Class according to IEC61643-1
B	DC-SWITCH	600V/32A
C	DC Array MPPT input terminals	MPPT1(3 poles for PVA+ and 3 poles for PVA-) MPPT2(3 poles for PVB+ and 3 poles for PVB-)
D	Ground kid Fuse	Note 2(Page 35)
E	DC input fuse	600V/15A---Note1(Page 35)
F	AC SPD	Class Ⅱ according to IEC61643-1
G	AC SPD fuse box	With fuse 32A/600V
H	Grid output terminals	A/B/C/N/PE
I	RS485 Connection	See section 5.3.10
K	Stem node	Note 3(Page 35)
L	PV Module Setting Switch	See section 6
⏚	Ground	See section 5.3.3

✔ Growatt 20000 TL3-US& Growatt 18000TL3-US connecting type 1



code	Details	
J	DC Array MPPT input terminals	MPPT1(2 poles for PVA+ and 2 poles for PVA-) MPPT2(2 poles for PVB+ and 2 poles for PVB-)
H	Grid output terminals	A/B/C/N/PE
I	RS485 Connection	See section 5.3.10
K	Stem node	Note 3(Page 35)
L	PV Module Setting Switch	See section 6
⏚	Ground	See section 5.3.3

✔ Growatt18000 TL3-US & Growatt 20000TL3-US connecting type 2



code	Details	
A	DC SPD	Class according to IEC61643-1
B	DC-SWITCH	600V/50A
C	DC Array MPPT input terminals	MPPT1(6 poles for PVA+ and 6 poles for PVA-) MPPT2(6 poles for PVB+ and 6 poles for PVB-)
D	Ground kid Fuse	Note 2(Page 36)
E	DC input fuse	600V/15A---Note1(Page 36)
F	AC SPD	Class Π according to IEC61643-1
G	AC SPD fuse box	With fuse 32A/600V
H	Grid output terminals	A/B/C/N/PE
I	RS485 Connection	See section 5.3.10
K	Stem node	Note 3(Page 35)
L	PV Module Setting Switch	See section 6
⏚	Ground	See section 5.3.3

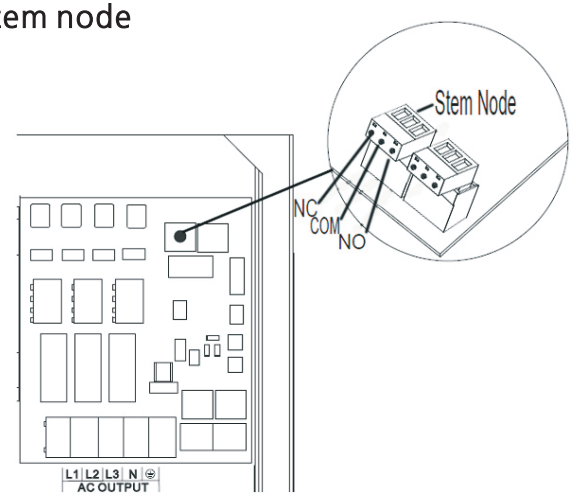
Note 1: Fuse Sizing

In any electrical system, fuses are used to protect wiring and equipment from excessive currents that can cause damage, heating or in extreme cases even fire. If the fuse rating is too small it could be blown during normal operation. If the fuse rating is too large, it cannot provide the needed protection. In PV systems, the minimum and maximum size of the series fuse is determined by the electrical ratings of the PV module as well as by UL and National Electrical Code (NEC) requirements. Be sure to consult with your PV module manufacturer for appropriate fuse ratings.
The minimum size of fuses and wiring are calculated using the Short Circuit Current Rating (Isc) of the PV module. The NEC requires that all fuses and wiring be sized for a minimum of 1.56 times the Isc of the PV module used in the system.
The proper size PV string fuse is determined by calculating 1.56 x Isc (of the PV module) and then rounding up to the next standard fuse size.
THE INVERTER DC FUSE SIZE: If the Isc of the PV module equals 9.6 Adc, then the fuse size is determined by 1.56x 9.6 = 14.98. The next standard fuse size would be a 15A, 600Vdc fuse.

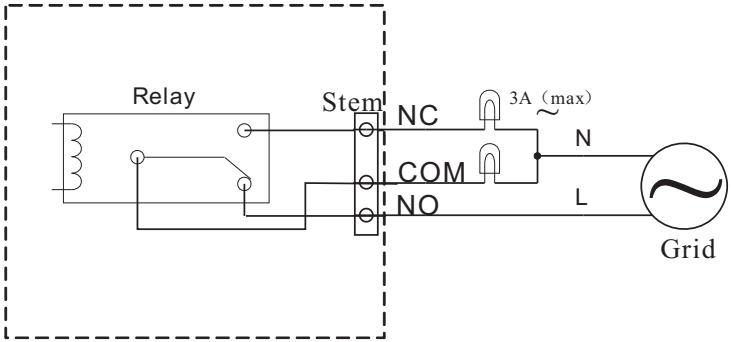
Note 2: Ground kid Fuse

Only used in the isolation transformer condition. For more information, please contact Growatt.

Note 3: stem node



The stem node is used to connect the light which powered by grid. So you can identify the state of the Growatt TL3-US by the light. The schematic of the stem node as follow:



In general, the "COM" and the "NO" is connecting, when the inverter in a warning or Error state, the "COM" and the "NC" is connecting.

i	Make sure the maximum current of the stem node is 3A.

5.7.2 AC cable requirements

The cable must be dimensioned in accordance with the local and national directives. The requirements for the minimum conductor cross-section derive from these directives. Influencing factors for cable dimension are the following: nominal AC current, type of cable, cable length, routing method, cable bundling, ambient temperature and maximum desired line losses.

i	Use only solid or stranded wire but not fine stranded wire.

Ambient temperature

The higher ambient temperature, the higher power losses

➢ Use cables with large cable cross-sections in installation sites with high ambient temperatures.

Routing method

The higher ambient temperature, the higher power lossesThe cables heat up during operation. If there are several cables in a conduit, the temperature of all cables increases.

➢ Use cables with a large cross section if there are several cables in one conduit

code	Name	Detail
A	Conductor cross-section	See the Conductor cross section in the flowing chart
B	Stripping insulation	12mm(0.47inch.)

For GROWATT TL3-US, the grid impedance of the AC cable must not exceed 0.5 Ohm. Otherwise, the GROWATT TL3-US will disconnect at full feed capacity due to excessive voltage at the feed-in point. AC cable losses should always remain under 1% too.

The details of conductor cross-section and the maximum cable lengths relative to GROWATT TL3-US are shown in the following table.

Maximal cable lengths between the three phase inverter and the sub distributor

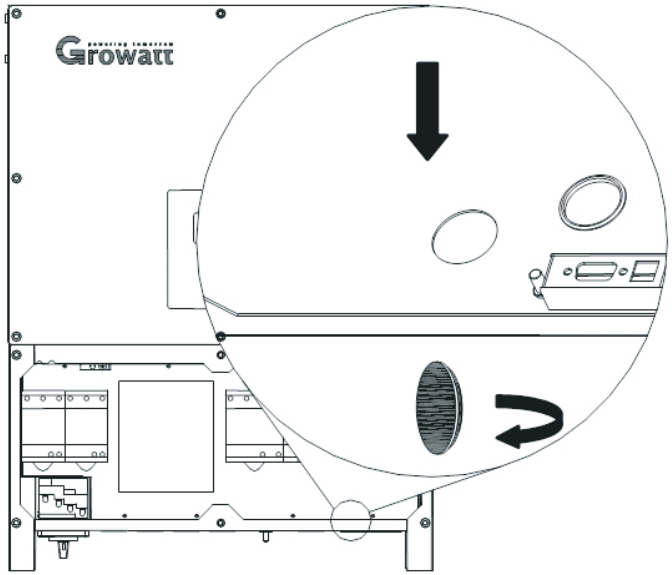
Model	Conductor cross section	Maximum cable length
Growatt 10000TL3-US (Type 1&Type 2 wire box)	#10~#8AWG(5.26~9mm²), 194℉ (90℃)	18m for #12AWG 50m for #8AWG
Growatt 12000TL3-US (Type 1&Type 2 wire box)	#10~#8AWG(5.26~9mm²), 194℉ (90℃)	14m for #12AWG 41m for #8AWG
Growatt 18000TL3-US (Type 1&Type 2 wire box)	#10~#8AWG(5.26~9mm²), 194℉ (90℃)	15m for #10AWG 25m for #8AWG
Growatt 20000 TL3-US （Type 1&Type 2 wire box)	#10~#8AWG(5.26~9mm²), 194℉ (90℃)	13m for #10AWG 23m for #8AWG

5.7.3 Connecting the AC cable in the Wire box

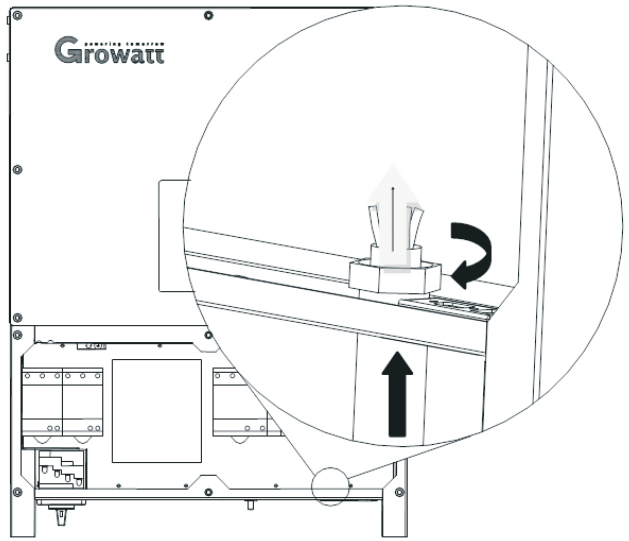
	Open terminals fully before insertion of the cables.
DANGER	Before connecting, make sure the AC cable is disconnected to the Unity from the AC breaker. Do not power connecting!

1.Open the wire box of the Growatt TL3-US

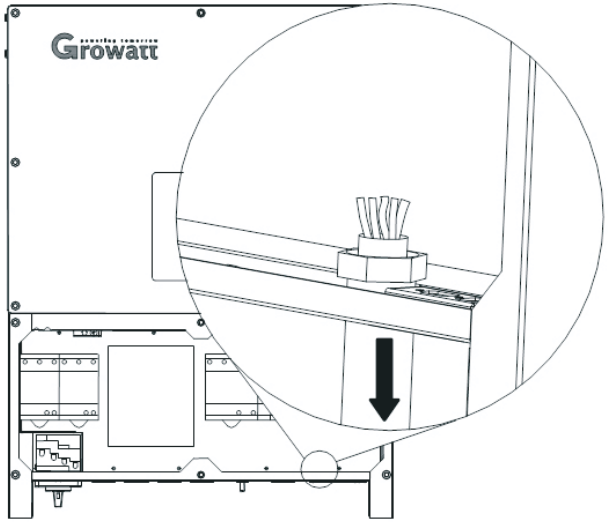
2.Knock off the plugs on the wire box and install rubber grommets instead of the plugs.



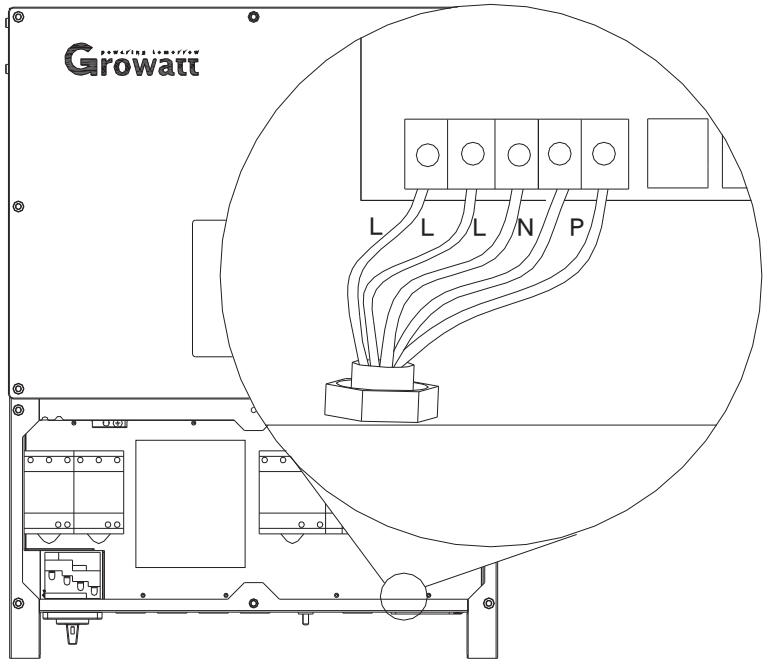
3. Feed the cable through the rubber grommet into the wire box.



4. Pull the cable back slightly so as to seal the rubber grommet.



5. Connect the AC device grounding green-yellow cable to the PE terminal , black cable to the terminal labeled N and the red wire cable to the terminals labeled L1(AC conductor A), L2(AC conductor B),L3(AC conductor C) separately .



6. Tighten the cables with a torque of 10 lb.-in (1.2 Nm).

7. Check that all terminals have the correct wiring and that the cables are secure.

✔ The AC cables are connected in the wire box.

5.7.4 DC cable requirements

i	Only use solid wire or stranded wire

The DC Cable design mean the from the panel to the input terminal of the inverter. When carrying out the cabling for the DC side, a few rules should be observed for optimal and fault-free operation, both with roof-mounted and free-standing devices.

- Use cables with connectors which are contact-proof and designed to avoid confusion.
- Cables should run through protective tubes or mounting frames to protect them from weathering and UV radiation. Cables which are hanging freely or which lie on stone or in water (> flat roof) are not allowed.
- It is advisable to carry out insulation and resistance measurements after every cable installation in order to locate any possible faults in this partial string, which is harder to do later in the whole system.
- The connection cables for all strings should be numbered to facilitate later fault location.
- In a large PV array the cross-section variants of the cables must be as few as possible in order to facilitate mounting and to avoid faulty installations due to confusion of cables. Here, cable losses should always remain under 1%.

The details of conductor cross-section relative to GROWATT TL3-US are shown in the following table.

Model	Conductor cross section	Maximum cable length
Growatt 10000TL3-US (Type 1&Type 2 wire box)	#10~#8AWG(5.26~9mm²), 194℉ (90℃)	18m for #12AWG 50m for #8AWG
Growatt 12000TL3-US (Type 1&Type 2 wire box)	#10~#8AWG(5.26~9mm²), 194℉ (90℃)	14m for #12AWG 41m for #8AWG
Growatt 18000TL3-US (Type 1&Type 2 wire box)	#10~#8AWG(5.26~9mm²), 194℉ (90℃)	15m for #10AWG 25m for #8AWG
Growatt 20000TL3-US (Type 1&Type 2 wire box)	#10~#8AWG(5.26~9mm²), 194℉ (90℃)	13m for #10AWG 23m for #8AWG

5.7.5 Connecting the DC cable in the Wire box

DANGER	High voltages on PV modules that are exposed to light ● Risk of death due to electric shock from touching a DC conductor. ● Do not touch the DC conductor. High voltages in the DC cables ● Risk of death or serious injury from touching a DC cable. ● Only connect the DC cable from the PV module to the inverter as described in this manual.

WARNING	Before connecting, make sure the DC switch in the wire box is turned off and measure the voltage to ensure the array output is non-hazardous. Danger of burning due to overheating ● Observe the National Electrical Code® 2008, Section 690.35

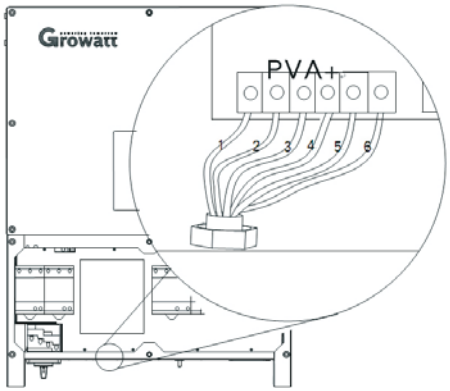
1.Knock off plugs on the wire box and Install rubber grommets instead of the plugs.

2.Push the DC cables through the grommet in the wire box in order to pierce the rubber grommet. Do not use sharp tools to pierce the rubber grommet.

3.Pull the cables slightly back in order to seal the grommet.

4.Open the screw terminals completely by turning them counterclockwise using a flat-head screwdriver.

5.Connect the DC wiring to the MPPT1 and MPPT2 array terminals shown in inverter per the specific array design.



i	About the wirebox DC connection of the Growatt TL3-US, please refer to page 87and page 88 for more detail

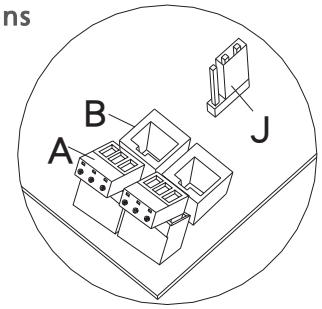
6.Tighten all cables in the terminal blocks in the wire box with a torque of 1.2Nm(10lbf.in) for type 1 of Growatt TL3-US while 0.5Nm(4.4lbf.in) for Type 2 of Growatt TL3-US.

7.Verify that all connections are correctly cabled and tightened to the correct torque. Pull on the cable in order to make sure that it is attached tightly enough in the terminal.

✔ The DC cables are connected in the wire box.

5.8 RS485 Signal Wiring Connections

code	Details
A	RS485 stander connector
B	RS485 Bus Connection via RJ45 connector
J	RS485 BUS balance jumper

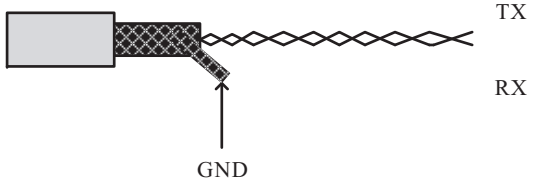


There are two types of the RS485 connection, you can choose the RJ45 or the standard connector, as showed A and B.

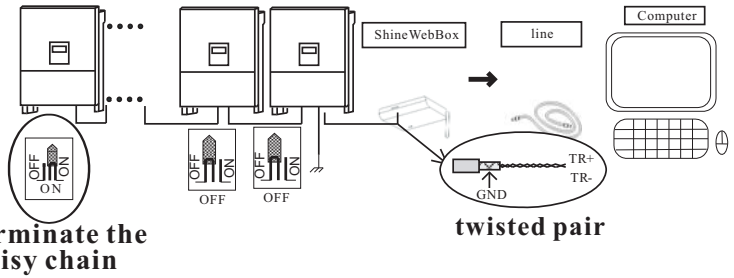
RS485 BUS balance jumper:

In RS485 communication circuit, when the T/R+ and T/R- lines reach a certain length (>100m), the line itself has impedance, in order to balance the impedance of the RS485 bus line, you'd better get the jumper to the state "ON" in RS485 BUS balance jumper of the remote inverter that the last one connects to the RS485 bus line while others keep "OFF" state.

The RS485 bus line is recommended not exceed 0.8 km when using the #20AWG RS485 communication stander line. Shielded twisted pair cable (STP), impedance 100...150 ohm is recommended.



NOTICE	1) In order to improve the Anti-jamming capability of RS485 communication, it is recommended that the GND terminal of the inverter which connects to the ShineWebBox must be connected to the EARTH. 2) Adopting shielded twisted-pair cable and effectively grounded 3)The strong electric field place must use galvanized tube shielding the twisted pair 4) The twisted pair should away from the high tension line, high voltage power line and other signal line



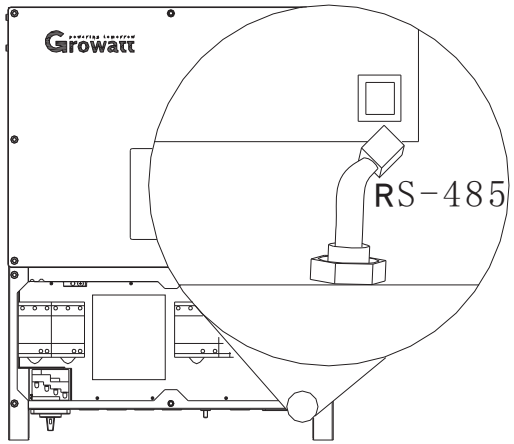
RS485 Bus Connection via RS485 stander connector:
connect three RS-485 leads： T/R+, T/R-, GND. into position shown.

RS485 Bus Connection via RJ45 connector:

	PIN	Signal name	Description	Note
RJ45 (1 2 3 4 5 6 7 8)	1,2,3,6	N/U		
	4	T/R+	+Data line	1
	5	T/R-	-Data line	1
	7.8	GND	Ground	2
Note	1: Required for RS485 communication. 2: The ground of the communication.			

	PIN	T568B color
RJ45 (1 2 3 4 5 6 7 8)	1	White/orange
	2	Orange
	3	White/green
	4	Blue
	5	White/blue
	6	Green
	7	White/brown
	8	Brown

1.Using Ethernet wire stripping pliers to strip insulation layer
2.Connecting the core of the wire into the RJ45 connector according to the TIA/EIA 568B standard as shown in the above table.
3.Connecting the RS485 cable in the Wire box.
4.Tighten the waterproof connector.

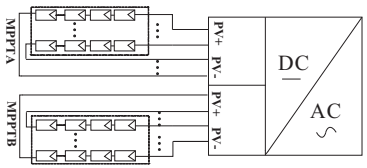


✔ RS485 Bus Connection via RJ45 connector

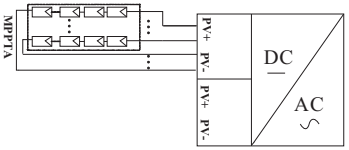
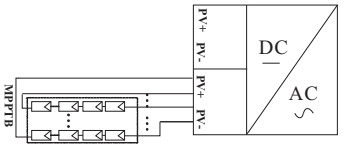
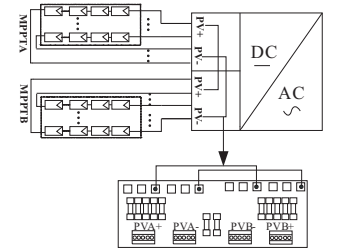
6 PV Module setting

A 2 bit switch is in the wire box of Growatt TL3-US which is used to set the PV module. Since the Growatt TL3-US has two independent MPPTs, the solar panels can be connected in two MPPT channels independent or just connected to MPPT A channel. In order to be identified by the Growatt TL3-US which channel has the solar panels, you have to set the PV module by the 2 bit switch. You have to refer to the following information:

Default PV Module setting chart

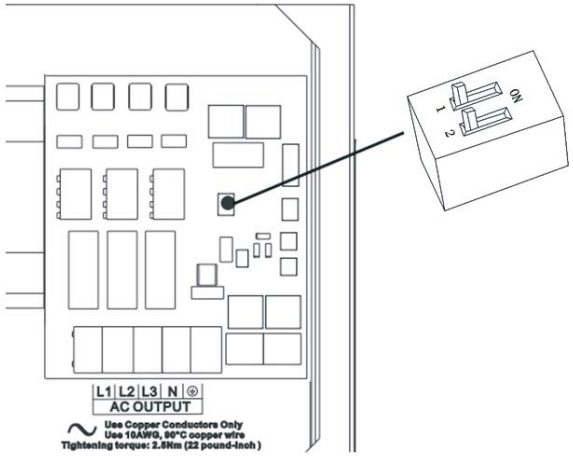
Switch state		Wiring diagram
S1	S2	
ON 1 2 (Default)		
OFF	OFF	

Other PV Module setting chart

ON 1 2 ON OFF	
ON 1 2 OFF ON	
ON 1 2 ON ON	

When set the Growatt TL3-US in parallel mode, you must using the standard line to connect PVA+to PVB+, and PVA - to PVB -

The location of the 2bit switch as fallow:



7 Commissioning

DANGER	High voltages in the PV system Risk of death or serious injury due to electric shock. • Only electrically skilled persons may perform work on the PV array.

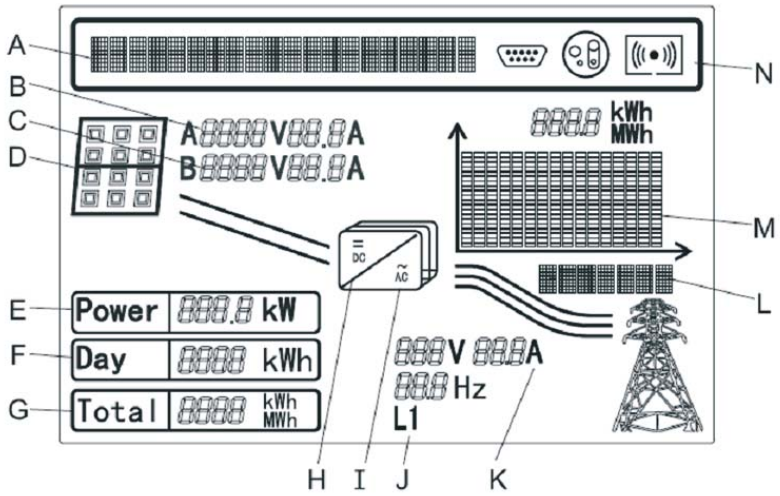
WARNING	• Under any condition! Make sure the maximum open circuit voltage (Voc) of each PV string is less than 600VDC.

Requirements:

- ✔ The AC cable is correctly connected.
- ✔ The DC cable is correctly connected.

7.1 Display and message

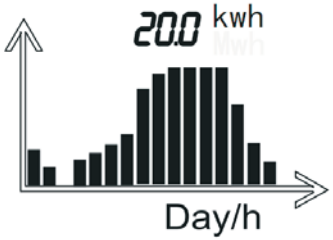
7.1.1 Graphic display



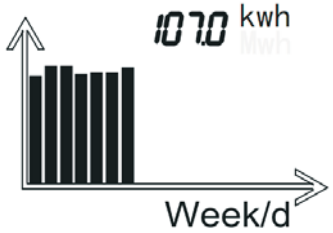
Position	Detail
A	Text line for displaying an event
B	Input voltage and current of MPPTA
C	Input voltage and current of MPPTB
D	PV array A and B, Light when the array voltage is above the start voltage(120V)
E	Current power
F	Daily energy
G	Total energy generated since the inverter was installed
H	Light when the array voltage is above the start voltage(120V)
I	Lighted when "H" is lighted and feed-in
J	Output phase of the line conductor, switch every 5 seconds.
K	Output voltage /current /frequency of the line conductor
L	Graphical display of the inverter energy/power
M	
N	RS232 communication
	RS485 communication
	Internal wireless communication
	External wireless communication

7.1. 1. 1 Graph

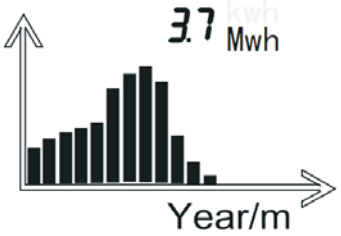
The inverter energy and/or power is shown as a graph on the display. The lower right-hand bar of the graph represents the current unit of time: Day/h, week/day, Year/y, Year/Y. The top bar of the graph represents the maximum value of the graph values. The daily graph is displayed by default. You can knock the enclosure lid three times to switch the current unit of time and the generation information.



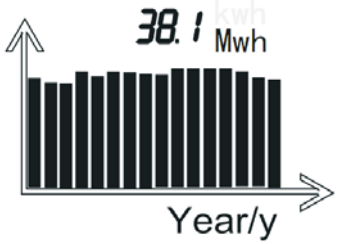
The graph shows recent 16 hours of power generation and the maximum value power of the 16 values.



The graph shows recent 7 days of power generation and the maximum value power of the 7 values.



The graph shows recent 12 months of power generation and the maximum value power of the 12 values.



The graph shows recent 16 years of power generation and the maximum value power of the 16 values.

7.1.1.2 Text line

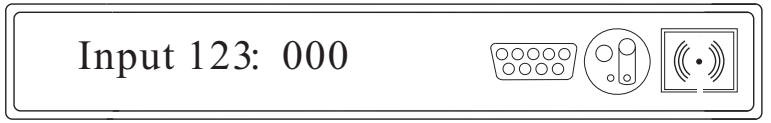
The Text line is used for displaying an event. Include the information of setting language, models, communication address and time. The "Power Rate" and "Power Factor" are take turn to display by default.
You can operate the settings as flows:

a) Input setting code

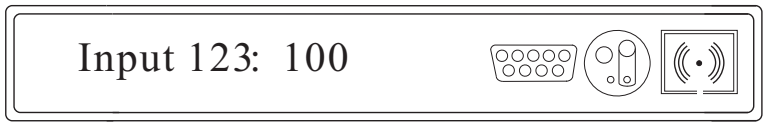
Before setting the language, COM Address and time, you have to input the setting code:

1) Knock the enclosure lid once every time until the text line switch to the text as flows:

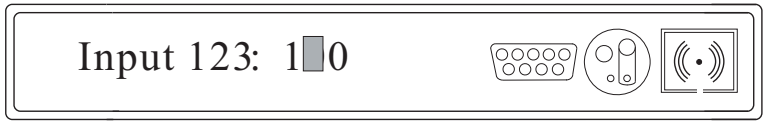
2) Knock the enclosure lid twice and the text will show as flows:



3) Knock the enclosure lid twice to let the higher number text "000" flash. And knock the enclosure lid once to change it from "000" to "100". Every time knock the enclosure lid once the highest number text will add 1, the range of number text is 0~9. Then knock the lid twice to verify it.

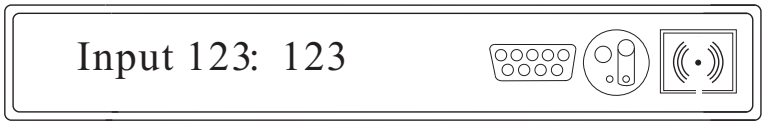


4) Then the middle number text will flash:



Knock the enclosure lid once to change it from "100" to "110" and then again to change it from "110" to "120". Then knock the lid twice to verify it.

5) You can set the lowest number from "120" to "123" approach introduced above.

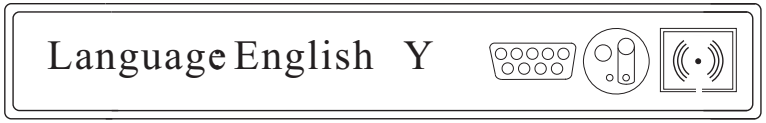


✔ Then you can set the language, COM address and time.

b) Setting language

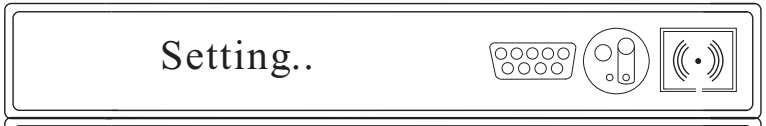
1) Knock the enclosure lid once every time until the text line switch to the text as flows:

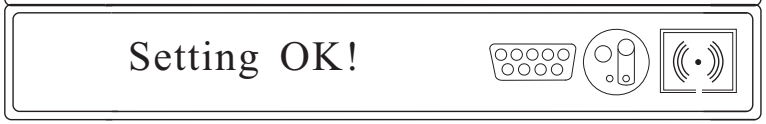
2) Knock the enclosure lid twice and the text will show the language.



3) You can choose the language by knocking the enclosure once, the language includes English, Deutsh, Espanol, Francais, Italiano.

4) Then you can knock the enclosure three times to confirm the language you have chosen. And the text line change as flows:





✔ The language is setting!

You can knock the lid four times to quit the setting menu.

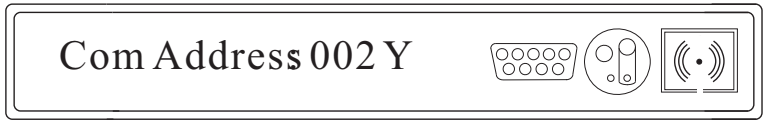
c) Setting Com Address

i	For the communicating, the inverter needs a communication address. In multi system, the addresses of inverters must be different from one to another.

1) Knock the enclosure lid once every time until the text line switch to the text as flows:

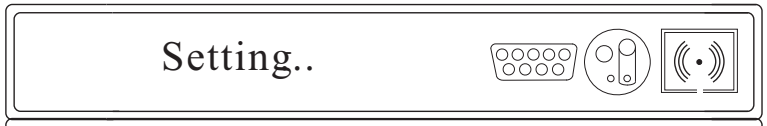
2) Knock the enclosure lid twice and the lower number text "1" will flash: 001.

3) If you want to change it, knock the enclosure lid once every time to change it



4) If you want to set the address more lager, knock the enclosure lid twice to let the higher number text "002" flashing. And knock the enclosure lid once every time to change it form:0~9. So as the highest number text. In the general condition, the maximum number of the address is within 32.

5) Then you can knock the enclosure three times to confirm the language you have chosen. And the text line change as flows:



✔ The Com Address is setting!

You can knock the lid four times to quit the setting menu.

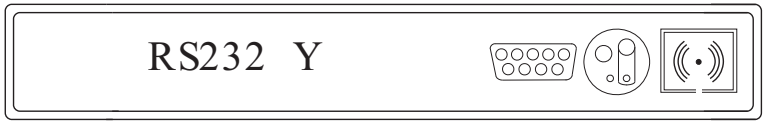
d) Switching the RS232 and the External wireless communication

As the Serial communication with the computer and the external wireless communication using the same serial port, we have to choose one. The RS232 is communicating to computer so that the computer can be connected to the inverter using our software tools.

Knock the enclosure lid once every time until the text line switch to the text as flows:

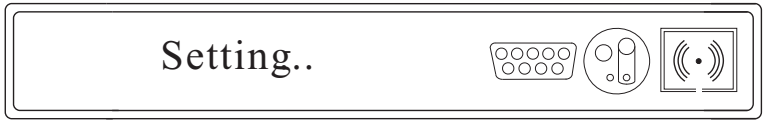
The RS232 is chose by default in the inverter.

1) Knock the enclosure lid once every time until the text line switch to the text as flows:



2) Knock the enclosure lid twice and switching to external wireless communication.

3) Then you can knock the enclosure three times to confirm it. And the text line change as flows:

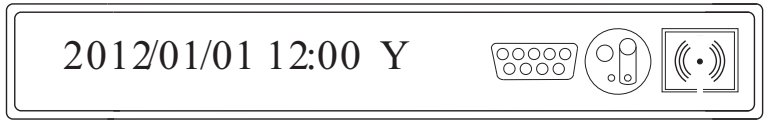


✔ The External wireless communication is setting!

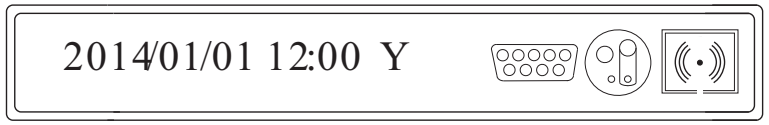
You can knock the lid four times to quit the setting menu.

e) Setting date and time

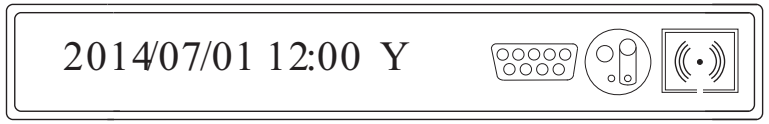
1) Knock the enclosure lid once every time until the text line switch to the text as flows (the time maybe different depends on the inverter):



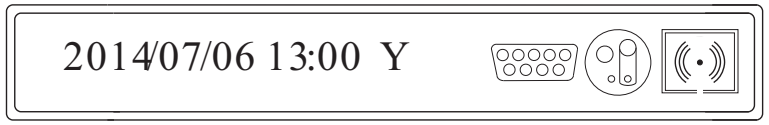
2) Knock the enclosure lid twice and switching to the year"2012", and the two lower number "2012" will flash, then you can knock once at a time to change it.



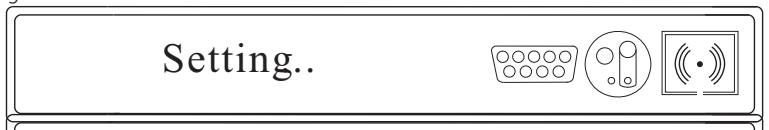
3) Knock the enclosure lid twice and switching to the month"01", and it will flash. Then you can knock once at a time to change it.



4) So as to setting the day and the time.



5) 1)Then you can knock the enclosure three times to confirm it. And the text line change as flows:



✔ The date and the time is setting!

You can knock the lid four times to quit the setting menu.

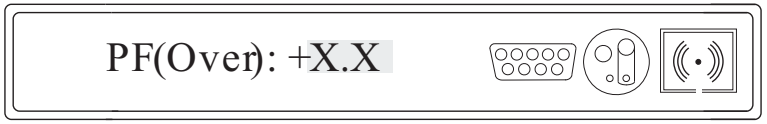
i	You can set all above by Growatt software "ShineTool" with computer. More information please go to the site: .

f) Other display

Knock the enclosure lid once every time and the text line switch to other interface about the information of the Growatt TL3-US:

- Displaying the internal bus+ and bus- voltage

- Displaying the PF value:



- Displaying the power factor:

- Displaying the serial number of the inverter:

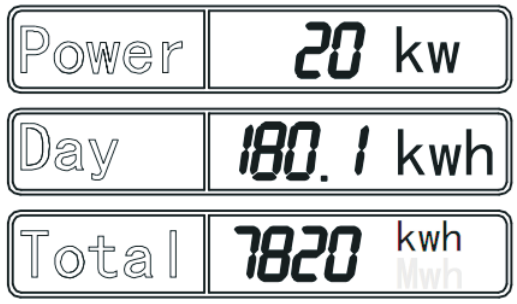
- Displaying the module of the inverter:

- Displaying the power type of the inverter:

- Displaying the software version of the inverter:

7.1.1.3 Power display

The power and energy of the inverter are displayed in three fields: Power, Day and Total. The display is updated every five seconds.



Power

The real-time power that has been feeding into the grid from the inverter

Day

The energy fed into the electricity grid on this particular day. This equals the energy generated from the inverter's start-up in the morning to the current time.

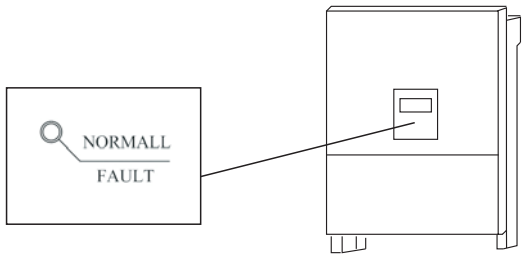
Total

The total energy that the inverter has fed into the electricity grid during its entire operating time

Measurement accuracy

The display values may be a little different from the actual values and must not be used for billing purposes. The inverter's measured values are required for the operational control and to control the current to be fed into the electricity grid. The inverter does not have a calibrated meter.

7.1.2 LED



The LED also represents the status of the inverter.

LED color /status	Inverter status
Green/constant	Operation
Red/constant	• Fault– contact installer • Standby model
Red/flashing	• Fans Fault-- contact installer • Software update

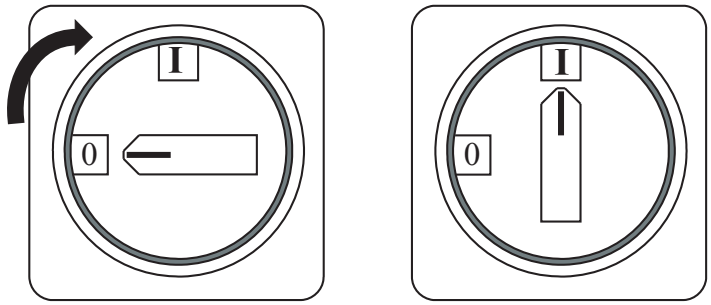
7.2 Operation checking on the Growatt TL3-US

i	About the LCD and LED, you can refer to the next section 6.2 for details.

1.Remove all covers from the PV array.

2.Switch on the AC breaker.

3.Turn the DC Disconnect to position "I".

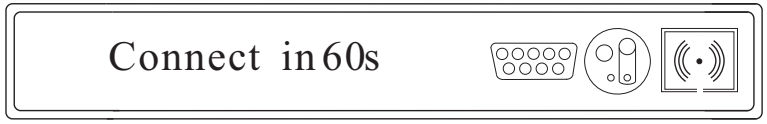


4. If the PV voltage input is above 120V, Growatt TL3-US is working. And text line of the LCD display in turn as follows:

Item	Growatt 10000 TL3-US	Growatt 12000 TL3-US	Growatt 18000 TL3-US	Growatt 20000 TL3-US
Module:	P7U1M2S1	P7U1M3S1	P7U1M5S1	P7U1M6S1
PV:	10000 US	12000 US	18000 US	20000 US
SN:	SN is the serial number of the inverter, every machine has its own serial number,SN12345678 for example.			
FW:	FW is the software version of the inverter, FW:CT1.0-ATD1.0 for example.			

5. If the PV voltage input is between 120V~150V, the Growatt TL3-US will work in a standby status. If the PV voltage is between 150V~600V, the Growatt TL3-US will work in a normal status. So you can check the input and output information as well as the status of the Growatt TL3-US on the LCD.

6. Once the Growatt TL3-US is working in a normal status, before parallel in the grid, it will take 60 seconds to check the inverter include the GFCI automatically. The LCD text line's information as follows:



7. When it counts to 0s, the inverter begins to parallel in the grid. Once it feeds to the grid successfully, the text line in the LCD will show as follows:

And the LED will turn to green.

➢ The Growatt TL3-US feeds to the grid successfully!

7.3 Two independent MPPT

The Growatt TL3-US includes dual input with independent MPPT, high speed and precise MPPT algorithm for real-time power tracking and energy harvesting, as well as transformerless operation for high performance efficiencies. The two MPPT channel can track the maximum power point independent when inverter get to separate input from solar panel and the two independent MPPT have no impact with each other.

i	Although the Growatt TL3-US can work well in Un-impact of two MPPT, it is recommended to configure the two MPPT channels with the same PV panels and power.

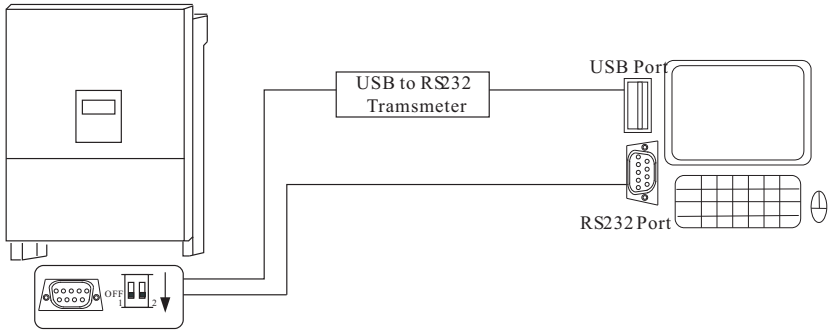
7.4 Communication

This section is about the setting information of the inverter and the monitor of the inverters.

7.4.1 Using ShineTool to set the information of the inverter

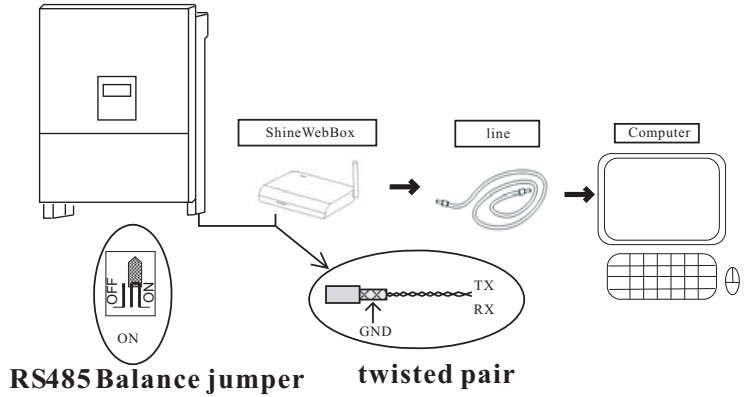
About the software of ShineTool and the usage of it please download from the web: www.growatt.com

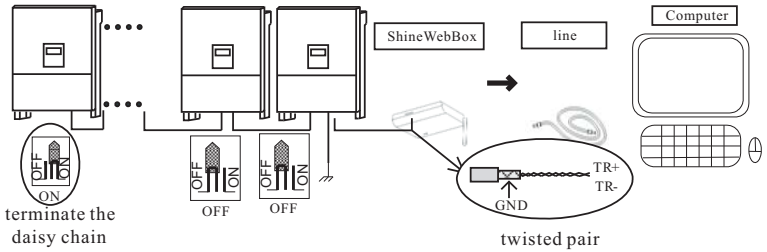
The connecting diagram as follows:



7.4.2 Monitor the inverters

1)Monitor the inverters with RS485



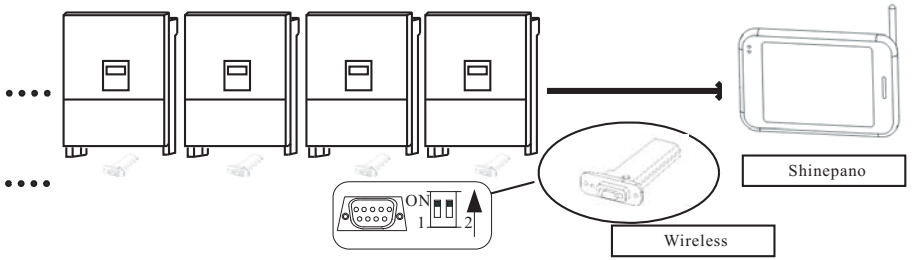


Monitor 2~26 inverter wire diagram

About the RS485 connector and the connection, you can go back to the section 5.3.10 for details. The above figure shows the scheme of monitoring inverters with ShineWeBox. Generally, the maximum number of the inverter is 26.

i	In general, when using the RS485, every inverter must have different com address. You can go back to the section 6.1.1.2 b for details.More information about the ShineWeBox go to the web: www.growatt.com

2)Monitor the inverters with External wireless.



About the External wireless section, you can go back to the section 6.1.1.2 c for details. The figure shows the scheme of monitoring inverters with Zigbee and SinePano. Generally, the maximum number of the inverters is 15. The communication distance between the Zigbee and the ShinePano is 300m in the open space.
More information about the Zigbee and ShinePano go to the web: www.growatt.com

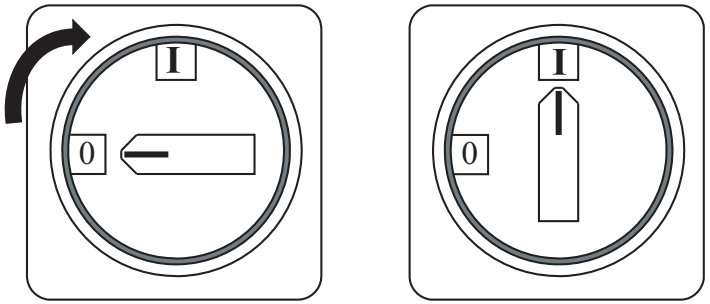
8 Booting and shutdown of the inverter

7.1 Display and message

WARNING	• Make sure the Growatt TL3-US has connected DC and AC cables correctly according to the wiring diagram of section 5.3.2 • Under any condition! Make sure the maximum open circuit voltage (Voc) of each PV string is less than 600VDC.

When the PV input voltage is above 120V, the Growatt TL3-US can be stared.

➢ Turn the rotary switch from the off position "O" to the on position "I" as following picture.



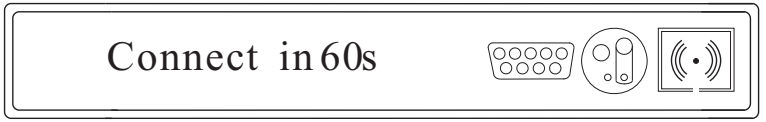
➢ Until the text line of the LCD shows the information as follows in proper sequence:

Item	Growatt 10000 TL3-US	Growatt 12000 TL3-US	Growatt 18000 TL3-US	Growatt 20000 TL3-US
Module:	P7U1M2S1	P7U1M3S1	P7U1M5S1	P7U1M6S1
PV:	10000	12000	18000	20000
SN:	SN is the serial number of the inverter, every machine has its own serial number,SN12345678 for example.			
FW:	FV is the software version of the inverter, FV:OD0.0-0D0.9 for example.			

➢ And then the text line will show the information and the LED will turn to red:

So you have to turn on the AC connector.

➢ Once the Growatt TL3-US is working in a normal status, before parallel in the grid, it will take 60 seconds to check the inverter include the GFCI automatically. The LCD text line's information as follows:



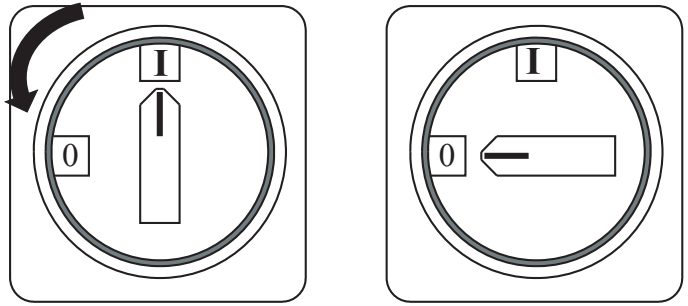
➢ When it counts to 0s, the inverter begins to parallel in the grid. Once it feeds to the grid successfully, the text line in the LCD will show as follows:

And the LED will turn to green

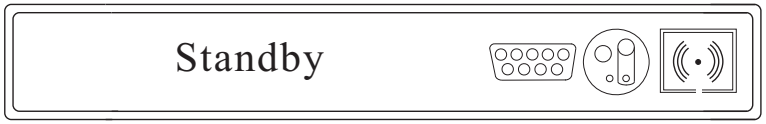
➢ Booting the Growatt TL3-US successfully!

8.2 Turn off the Growatt TL3-US

➢ Turn the rotary switch from the On position "I" to the Off position "O" as following picture.



➢ Wait until the text line of the LCD shows:



And the LED will turn to red.
In this state, it is working in a standby module from the grid power.

➢ Turn off the AC connector until the LCD and the LED are blanked.

✔ Shutdown the Growatt TL3-US successfully!

⚠	For safety, do not open wire box until 20 minutes passed.

9 Cleaning and Care

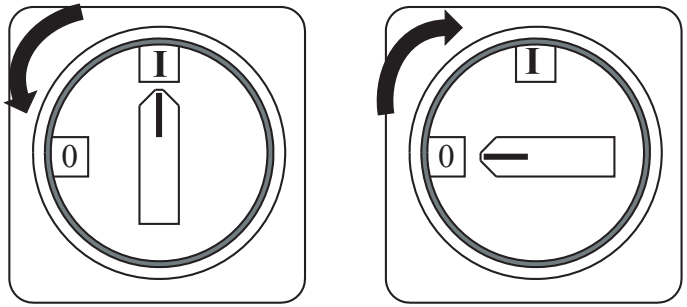
9.1 Checking the inverter

- Ask the installer to check for correct inverter operation at regular intervals.
- Check whether there is any externally visible damage to the inverter.

If there is any externally visible damage to the inverter, contact the installer.

9.2 Checking the DC switch

- Once a year, turn the rotary switch from the On position to the Off position 5 times in succession. This cleans the contacts of the rotary switch and prolongs the electrical endurance of the DC Disconnect.



9.3 Cleaning the Inverter

If the inverter is dirty, clean the enclosure lid, the display, and the LEDs using only clean water and a cloth. Do not use any cleaning agents (e.g. solvents or abrasives).

⚠	Before any operation, please disconnect the DC switch and AC switch, and waiting for at least 10 min until the internal bus capacitance discharge completely.

9.4 Cleaning the Fan Guards

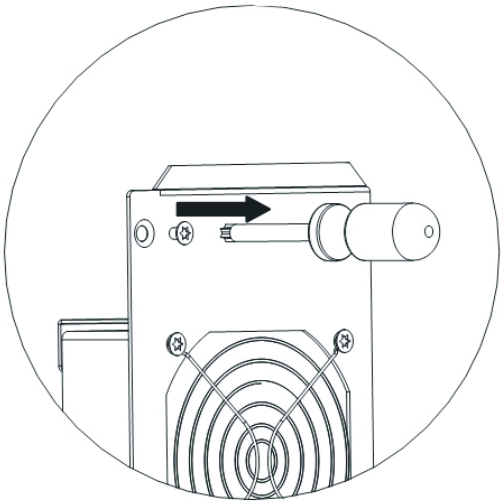
- Check whether the fan guards are dusty or dirt-clogged.
- If the fan guards are dusty, clean them with a vacuum cleaner.

⚠	• Before any operation, please disconnect the DC switch and AC switch, and waiting for at least 10 min until the internal bus capacitance discharge completely.

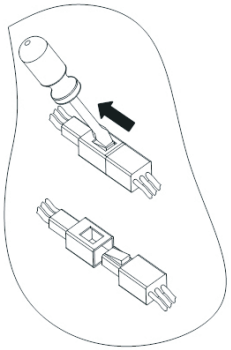
9.5 Replace fans

⚠	• It must be carried out by qualified, trained personnel and incompliance with all prevailing local codes and regulations • Before any operation, please disconnect the DC switch and AC switch, and waiting for at least 10 min until the internal bus capacitance discharge completely.

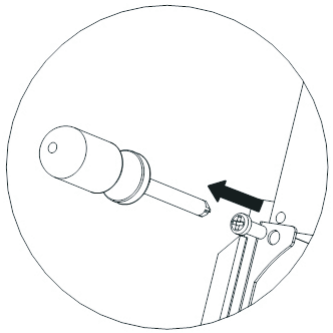
➢ Remove the screws on the fan guards.



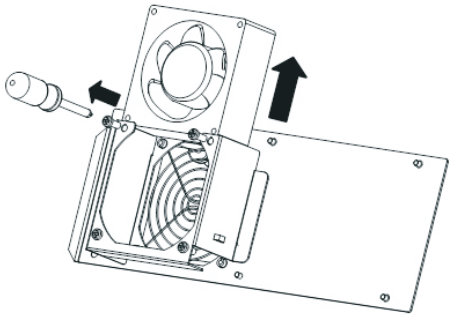
➢ Take apart the line of the fans by screwdriver



➢ Remove the screws inside the fan guards



➢ Remove the fans from the fan guards.

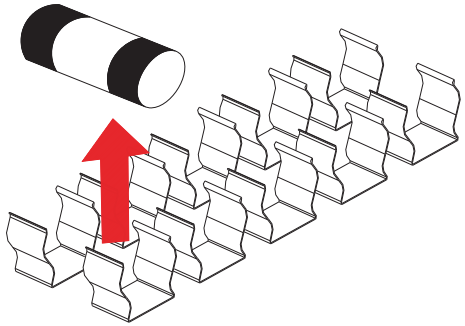


✔ Replace a new fan.

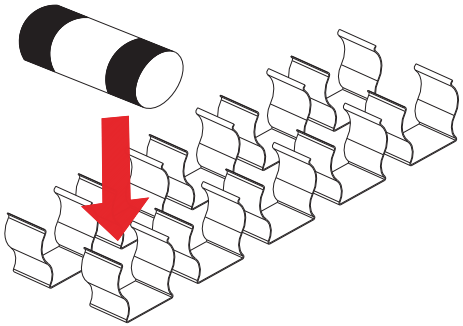
9.6 Replace fuse

	• It must be carried out by qualified, trained personnel and in compliance with all prevailing local codes and regulations • Before any operation, please disconnect the DC switch and AC switch, and waiting for at least 10 min until the internal bus capacitance discharge completely.

- Open the wire box carefully.
- Checking the broken fuse and drawing it out carefully.



- Replace a new one.



- Close the wire box.
- Replace new fuse.

10.1 Dismantling the Growatt TL3-US

1) Open the wire box of the Growatt TL3-US.

2) Remove all cables connected to the wire box.

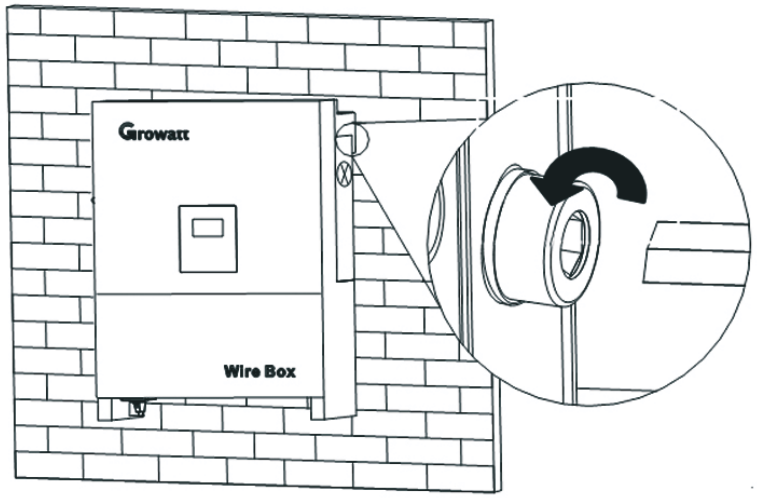
3) Close the wire box.

4) CAUTION

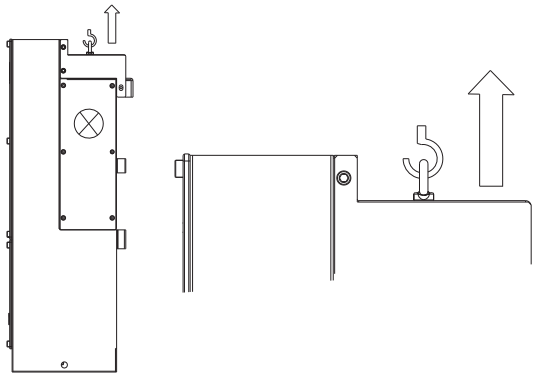
The Growatt TL3-US may fall down due to inappropriate disassembly.
Contusions or bone fractures due to the heavy weight of the Growatt TL3-US.

	• Prior to disassembling the Growatt TL3-US, take its weight of 102 lb. (46 kg) into account of the Growatt 10000 / 12000TL3-US,140 lb. (65 kg) into account of the Growatt 18000 / 20000TL3-US . • Use suitable lifting technique when disassembling.

5) Remove both safe screws on the left and right side of the Growatt TL3-US that attach it to the wall mounting bracket.



6) Handing up the Growatt TL3-US slowly by the rings.



7) 2 people must transport the Growatt TL3-US using the side handles at the bottom.

10.2 Packaging the Growatt TL3-US

Pack the Growatt TL3-US. Use the original packaging or packaging that is suitable for the weight and dimensions of the inverter..

10.3 storage of inverter.

If you want to store the inverter the inverter in your warehouse, you should choose an appropriate location to store the inverter.

- The unit must be stored in original package and desiccant must be left in the package
- The storage temperature should be always between – 40°F (– 40°C) and +140 °F +60°C). And the storage relative humidity should be always between 0 and 95%.
- If there are a batch of inverters need to be stored, the maximum layers for original carton is four.
- After long term storage, local installer or service department of GROWATT should perform a comprehensive test before installation.

10.4 Disposal

Dispose of the Growatt TL3-US in accordance with the disposal regulations for electronic waste that apply at the installation site.

Trouble Shooting 11

DANGER	Normally grounded conductors may be ungrounded and energized when a PV Isolation Low is indicated. • Risk of electric shock • Test before touching • Work on the Growatt TL3-US must be carried out by qualified personnel.

The system status is identified through warning or error signals displayed on the LCD display and the LED. The following tables briefly describe the two types of signals which may be displayed.

11.1 Warnings(W)

Warnings (W) identify the current status of the Growatt TL3-US. Warnings do not relate to a fault and it does not affect the normal running of the Growatt TL3-US. When a (W) with a number after it appears in the display, it indicates a Warning Code and is usually cleared through an orderly shutdown/re-set or a self corrective action performed by the inverter. See the (W) codes in the following table.

Warning message	Description	Suggestion
Warning 100	The problem of fan(s)	See Note1 below the chart
Warning 103	Reading EEPROM fail	Restart inverter
Warning 105	Writing EEPROM fail	Restart inverter
Warning 106	The problem of SPD	Contact Growatt

If the suggestions do not work, please connect to the Growatt.

Note 1: the Growatt10000/12000TL3-US has two fans (one internal and one outside); the Growatt18000/20000TL3-US has three fans (one internal and two outside).

	Growatt 18000/ 20000TL3-US			Growatt 10000/12000TL3-US	
fan	Internal	Outside A	Outside B	Internal	Outside
Fault	Error 3	Error 1	Error 2	Error 2	Error 1
	Error 1，3		/	Error 1，2	
	/	Error 2，3		/	
	Error 1，2	/	Error 1，2		
	Error 1，2，3				

Once the internal fan of Growatt 18000/ 20000TL3-US or Growatt 10000/ 12000TL3-US has Error, the inverter will stop working. If the outside fan(s) has Error(s), the inverter still work, but the power it feeds into the grid is limited to the temperature itself.

So, if the internal fan has Error, you should to connect to the Growatt to replace the internal fan, do not replace it by yourself!

If the outside fan(s) has(have) problems, connect to the supplier or GROWATT to replace it(them) by the qualified personnel.

11.2 Errors(E)

Errors(E) codes identify a possible equipment failure, fault or incorrect inverter setting or configuration. Any and all attempts to correct or clear a fault must be performed by qualified personnel. Typically, the (E) code can be cleared once the cause or fault is removed. Some of the (E) codes, Error as indicated in the table below, may indicate a fatal error and require you to contact the supplier or the Growatt to replace a new one.

Error code	Meanings	Suggestion
Error 101	Internal communication with host failed	Contact Growatt
Error 106	Redundant sample circuit of Insulation values are different	Contact Growatt
Error 107	Redundant sample circuit of GFCI values are different	Contact Growatt
Error 108	Internal power test fail	Contact Growatt
Error 109	Internal overcurrent.	Contact Growatt
Error 110	Output overcurrent.	Contact Growatt
Error 111	IGBT drive fault	Contact Growatt
Error 112	AFCI test fail (to be developed)	Contact Growatt
Error 117	Inverter relay fault	Contact Growatt
Error 119	GFCI fault.	Contact Growatt
Error 121	Internal communication with slave failed	Contact Growatt
Error 122	Internal bus over/under voltage.	Contact Growatt
No AC Connection	The grid is not connected to the inverter.	Check the grid break
PV Isolation Low	PV Insulation value is outrange	Contact Growatt
Residual I High	Redundant current is outrange	Contact Growatt
Output high DCI	Output current DC bias is high	Contact Growatt
PV Voltage High	PV input voltage is above 600V	Check the solar panel configuration and wiring
AC V Outrange	The grid voltage is outrange	Check the grid voltage by the LCD
AC F Outrange	The grid frequency is outrange	Check the grid frequency by the LCD
PV SW Set Error	PV module set wrong	Check PV wiring and refer to chart6: PV MODULE SETTING

12 Specification

12.1 Specification of the Growatt TL3-US

Information	If the input current supplied by the photovoltaic field connected to the inverter is above the maximum usable value and the input voltage is within the allowed range, the inverter will not be damaged and still work normally.

Growatt 10000TL3-US and Growatt 12000TL3-US

	specification	
	Growatt10000 TL3-US	Growatt 12000 TL3-US
INPUT DATA(DC)		
Nominal DC power	10500W	12500W
Max. DC voltage	600V	600V
PV voltage range MPP	250V-600V	250V-600V
Min. DC voltage	80V	80V
Start voltage	120V	120V
Max. input current	50A	50A
Max. input short circuit current	32A/32A	32A/32A
Max. input current per Channel	25A	25A
Number of MPP trackers	2	2
Max. number of parallel strings（pair）	3	3

	OUTPUT DATA(AC)	
Nominal output power	10000W	12000W
Max. AC voltage	480V	480V
Nominal AC grid frequency	60Hz	60Hz
AC grid frequency range	59. 3-60. 5Hz	59. 3-60. 5Hz
Max. output current (cos φ=1)	12A	14. 5A
Power factor (cos φ)	0.9 Leading to 0.9 Lagging	0.9 Leading to 0.9 Lagging
Phase conductors	1	1
Harmonics	<3%	<3%

	EFFICIENCY	
Max efficiency	96.5%	96.5%
CEC-Weighted Efficiency	95.5%	95.5%

	PROTECTION DEVICES	
Electronics string fuse	yes	yes
DC reverse-polarity protection	yes	yes
Input over voltage protection-Varistor	yes	yes
Input over voltage protection-DIN rail surge arrester（Option）	ClassII	ClassII

DC insulation measure	yes	yes
AC short circuit protection	yes	yes
Galvanic Isolation	NO	NO
Output over voltage protection-Varistor	yes	yes
Output over voltage protection-DIN rail surge arrester（Option）	ClassII	ClassII

	GENERAL DATA	
Diemensions(W/H/D)in mm	530/705/247	530/705/247
Weight(kg)	46	46
Operation temperature range	－25 °C … +60 °C	－25 °C … +60 °C
Noise emission	≤55dB	≤55dB
Relative Humidity	0~95%	0~95%
Altitude	≤2000m	≤2000m
Consumption(night)	≤3W	≤3W
Topology	Transformerless	Transformerless
Cooling concept	Fans	Fans
Electronics protection rating/connection area	Type 3R	Type 3R

	FEATURE	
LCD Display	yes	yes
Interface: RS232/RS485/ Bluetooth/RF/Zigbee	yes/yes/opt/opt/opt	yes/yes/opt/opt/opt
Warranty:10years/15 years	yes/opt	yes/opt
Certificates and approvals	UL1741,UL1998,IEEE1547,FCC part 15(class A&B),CSA C22.2 No.107.1	

Growatt TL3-US 18000 and Growatt TL3-US 20000

	specification	
	Growatt 18000 TL3-US	Growatt 20000 TL3-US
INPUT DATA(DC)		
Nominal DC power	18700W	20850W
Max. DC voltage	600V	600V
PV voltage range MPP	250V-600V	250V-600V
Min. DC voltage	80V	80V
Start voltage	120V	120V
Max. input current	84A	84A
Max. input short circuit current	50A/50A	50A/50A
Max. input current per Channel	42A	42A
Number of MPP trackers	2	2
Max. number of parallel strings（pair）	6	6

	OUTPUT DATA(AC)	
Nominal output power	18000W	20000W
Nominal AC voltage	480V	480V
AC voltage range	59. 3-60. 5Hz	59. 3-60. 5Hz
Nominal AC grid frequency	60Hz	60Hz
AC grid frequency range	59. 3-60. 5Hz	59. 3-60. 5Hz
Max. output current (cos φ=1)	21. 5A	24A
Power factor (cos φ)	0.9 Leading to 0.9 Lagging	0.9 Leading to 0.9 Lagging
Phase conductors	1	1
Harmonics	<3%	<3%

	EFFICIENCY	
Max efficiency	97.5%	97.5%
CEC-Weighted Efficiency	96.5%	96.5%

	PROTECTION DEVICES	
Electronics string fuse	yes	yes
DC reverse-polarity protection	yes	yes
Input over voltage protection-Varistor	yes	yes
Input over voltage protection-DIN rail surge arrester（Option）	ClassII	ClassII
DC insulation measure	yes	yes
AC short circuit protection	yes	yes
Galvanic Isolation	N0	N0
Output over voltage protection-Varistor	yes	yes
Output over voltage protection-DIN rail surge arrester（Option）	ClassII	ClassII

	GENERAL DATA	
Diemensions(W/H/D)in mm	650/740/247	650/740/247
Weight(kg)	66	66
Operation temperature range	－25 °C … +60 °C	－25 °C … +60 °C
Noise emission	⩽55dB	⩽55dB
Relative Humidity	0~95%	0~95%
Altitude	⩽2000m	⩽2000m
Consumption(night)	⩽3W	⩽3W
Topology	Transformerless	Transformerless
Cooling concept	Fans	Fans
Electronics protection rating/connection area	Type 3R	Type 3R

	FEATURE	
LCD Display	yes	yes
Interface: RS232/RS485/ Bluetooth/RF/Zigbee	yes/yes/opt/opt/opt	yes/yes/opt/opt/opt
Warranty:10 years/ 15 years	yes/opt	yes/opt
Certificates and approvals	UL1741,UL1998,IEEE1547,FCC part 15(class A&B),CSA C22.2 No.107.1	

12.2 DC Switch information

Maximum DC voltage	Growatt TL3-US	Growatt TL3-US
	10000/12000	18000/20000
DC operating voltage range	600V	600V
Maximum DC operating current	32A	50A
Maximum DC short-circuit current	32A	50A

12.3 Tripping Limits and Tripping Times

Nominal frequency	Tripping limit	Tripping frequencies	Tripping times
60 Hz	>60.5Hz	60.45 Hz to 60.55 Hz	Max.0.150s
	<59.3Hz	59.28 Hz to 59.40 Hz	Max.0.150s

Nominal Voltage	Tripping limit	Tripping times
277 V	50%	Max.0.15s
	88%	Max.0.15s
	110%	Max.0.15s
	120%	Max.0.15s

Accuracy：

Tripping limit: ±2 % of nominal grid voltage

Tripping times: ±0.1 % of nominal trip time

Tripping frequencies: ±0.1 % of nominal frequency

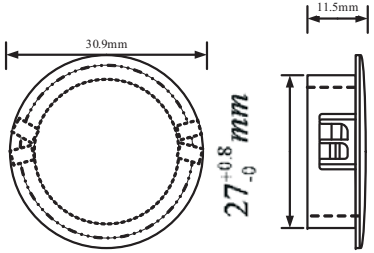
12.4 Torque Values and Cable Sizes

	in-lb	Nm	Wire size
Growatt 10000/12000TL3-US			
DC terminal	40	4. 5	#10~#8AWG(5.26~9mm2), 194℉(90℃) for each pole
AC terminal	40	4. 5	#12~#8AWG(3.33~9mm2), 194℉(90℃) for each pole
Attachment to the wall mounting bracket	44	5	--
safety-lock screws	53	6	--
Wire box enclosure lid	53	6	--
Growatt 18000/20000TL3-US			
DC terminal	40	4. 5	#10~#8AWG(5.26~9mm2), 194℉(90℃) for each pole
DC terminal	40	4. 5	#12~#8AWG(3.33~9mm2), 194℉(90℃) for each pole
Attachment to the wall mounting bracket	44	5	--
safety-lock screws	53	6	--
Wire box enclosure lid	53	6	--

*see National Electrical Code®, 310.16

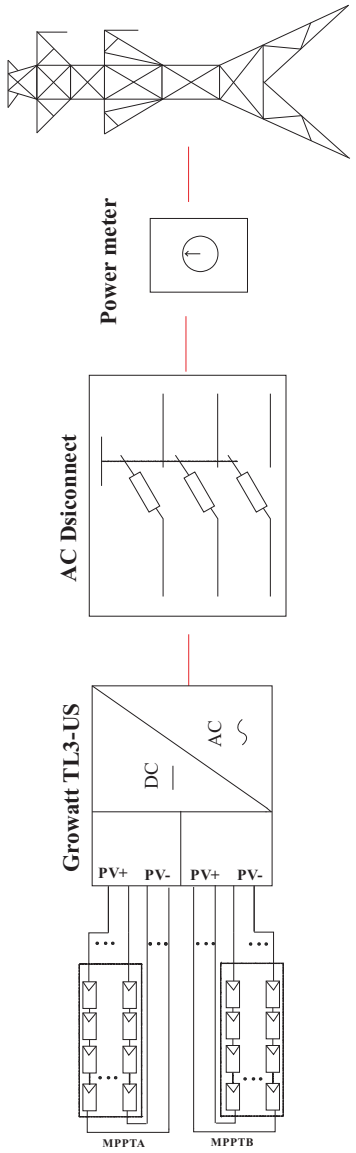
13 Spare Parts and Accessories

If needed, you can order these from Growatt specialty retailer.

Name	Description	Growatt order number
Fans	Internal or outside fans of the Growatt TL3-US	Growatt TL3-US Fan
ShineWebox	communication data logger	ShineWebox
ShinePano	communication data logger	ShinePano
Zigbee	communication data logger	Zigbee
Wore box plug		Growatt TL3-US plug
Fuse	SPD fuse of Growatt TL3-US DC input fuse of Growatt TL3-US	Growatt TL3-US Fuse
SPD	SPD of Growatt TL3-US	Growatt TL3-US SPD

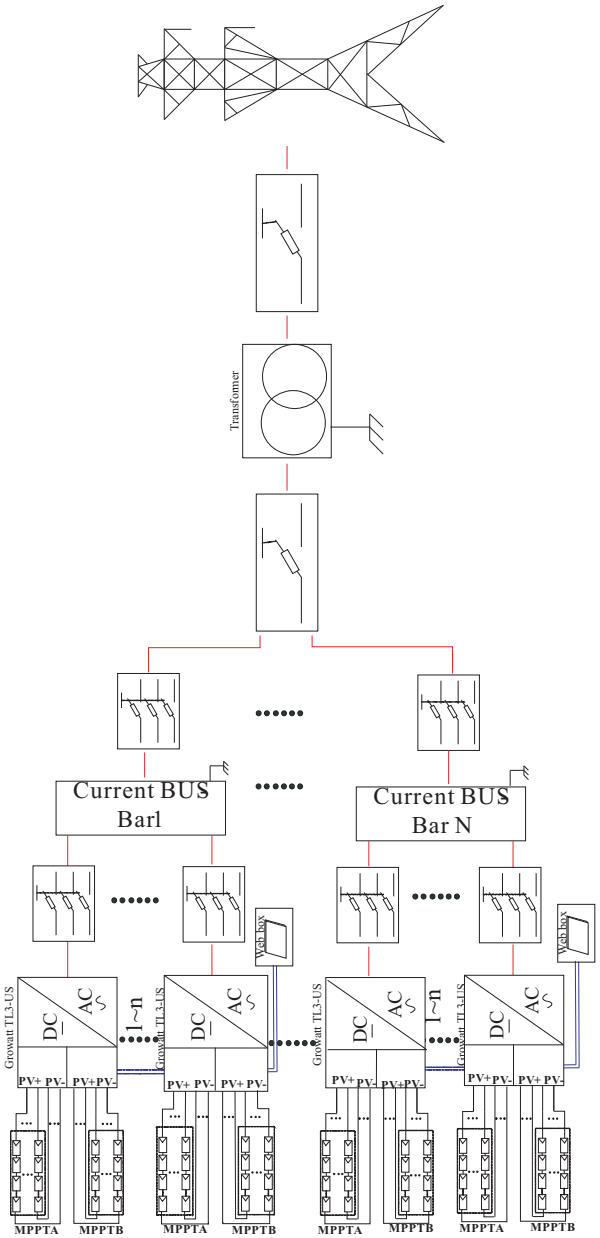
14 Inverter installation plan

14.1 Single inverter



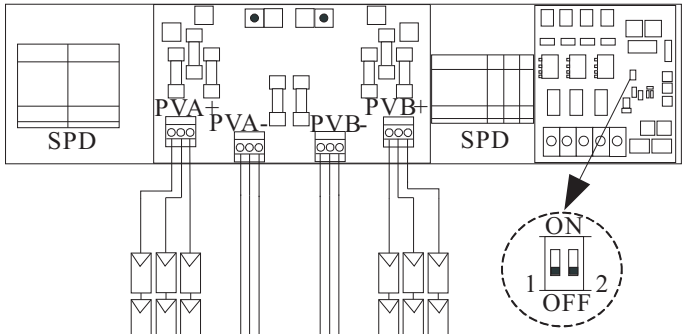
Note: The schematic only showed the Growatt TL3-US type 1(wire box with fuses). So as the Growatt TL3-US type 2.

14.2 Multi inverter



Note: The schematic only showed the Growatt TL3-US type 1(wire box with fuses). So as the Growatt TL3-US type 2.

Growatt10000&12000TL3-US Type2 default mode DC connection

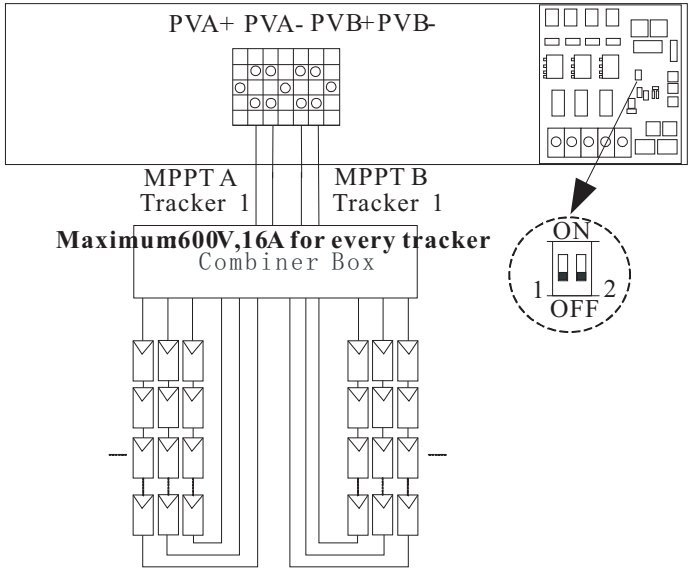


MPPT A
String 1 to String 3

MPPT B
String 1 to String 3

Maximum600V,15A for every string

Growatt10000&12000TL3-US Type1 default mode DC connection



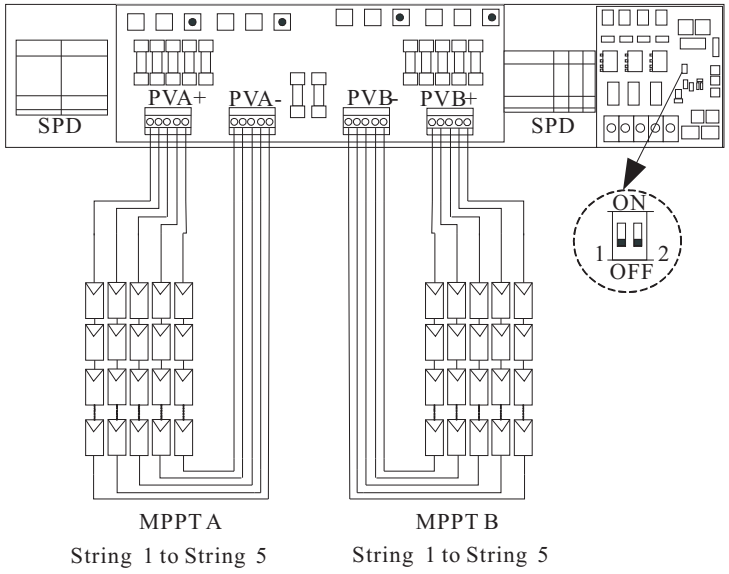
MPPT A
Tracker 1

MPPT B
Tracker 1

Maximum600V,16A for every tracker

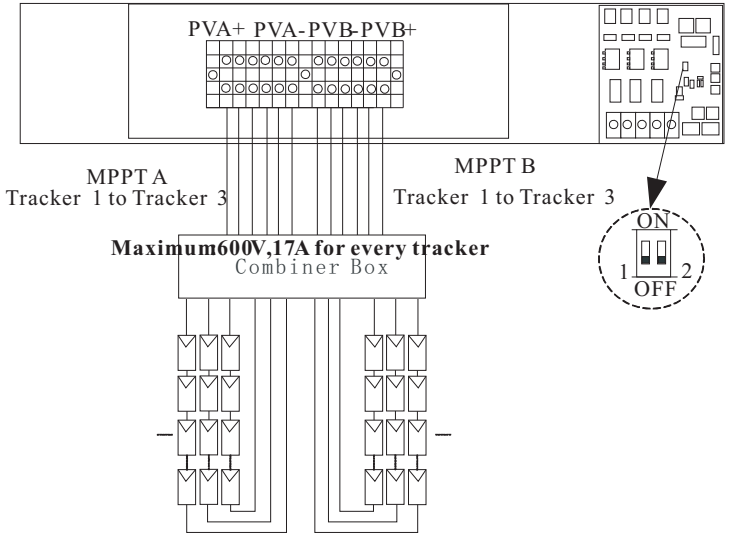
Combiner Box

Growatt18000&20000TL3-US Type 2 default mode DC connection



Maximum600V,15A for every string

Growatt18000&20000TL3-US Type 1 default mode DC connection



Contact 15

If you have technical problems concerning our products, contact your installer or Growatt. During inquiring, please provide below information:

- Inverter type
- Modules information
- Communication method
- Serial number of Inverters
- Error code of Inverters
- Display of inverters

Growatt New Energy Technology Co., Ltd
Jiayu Industrial Zone, #28 Guanghui Road, Shiyan,Bao An District,Shenzhen
518000, P.R. China

Tel: +86 (0)755 2747 1900
Fax: +86 (0) 755 2749 1460
Email: service@ginverter.com
Website: www. growatt.com